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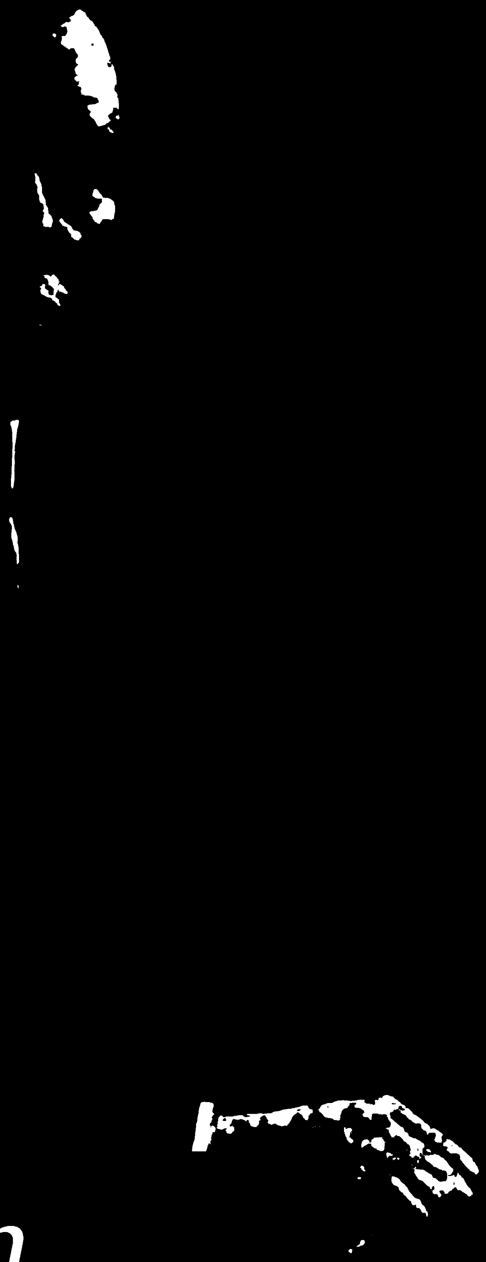

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National Electric Light Association. Convention

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National
Electric Light Association

THIRTY-FIFTH CONVENTION

Proceedings

VOLUME I

General Sessions
Executive Session
Public Policy Session
Company Session

Papers, Reports and Discussions

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CONTENTS

VOLUME I

PAGE
1—Conventions of the Association xxiii
2—Presidents of the Association xxiv
3—Honorary Members xxv
4—Officers and Executive Committee xxvi
5—Committees to Report to the Thirty-fourth Convention xxvii

GENERAL SESSIONS

FIRST GENERAL SESSION—JUNE 11, 10 A. M.

1—Welcome to the City. G. F. COTTERILL, Mayor . . 2
2—Address of President GILCHRIST 8
3—Report of Committee on Organization of the Industry. H. H. SCOTT 24
4—Report of Secretary. T. C. MARTIN 29
5—Report of Insurance Expert. W. H. BLOOD, JR. . 35
6—Report of Committee on Progress. T. C. MARTIN. 41
7—Report on *Question Box*. E. A. EDKINS . . . 160
8—Paper: "Expanded Loyalty." PAUL LÜPKE . . 177

SECOND GENERAL SESSION—JUNE 12, 10 A. M.

1—Report of Rate Research Committee. E. W. LLOYD. 184
2—Paper: "The Desirability as a Central-Station Load of Pumping for Municipally Owned Water Works." CHAS. A. MUNROE 254

EXECUTIVE SESSION—JUNE 12, 12.30 P. M.

1—Action on Report of Public Policy Committee. ARTHUR WILLIAMS 258
2—Presentation of Proposed Constitutional Amendments. FRANK W. FRUEAUFF 259
3—Report of Treasurer. GEORGE H. HARRIES . . . 260
4—Election of Nominating Committee 263

PUBLIC POLICY SESSION—JUNE 12, 8.30 P. M. PAGE

1—Musical Program.

2—Reading of Report of Public Policy Committee. SAMUEL INSULL 268

3—Report of Medical Commission on Resuscitation from Shock. W. C. L. EGLIN 328

4—Lecture: "Electrification of the Panama Canal" (illustrated by lantern slides). D. B. RUSHMORE.

COMPANY SECTIONS SESSION—JUNE 13, 3 P. M.

1—Report of Committee on Award of Doherty Gold Medal. W. W. FREEMAN 334

2—Paper: "Educating Central-Station Employees." H. E. GRANT 336

3—The Proposed Company Section Lecture Bureau. T. C. MARTIN 359

4—Experience Meeting as to Company Section Work.

THIRD GENERAL SESSION AND EXECUTIVE SESSION—

JUNE 13, 2.30 P. M.

1—Paper: "Some Uses of Metals." DR. W. R. WHITNEY 365

2—Report of Committee on Street Lighting. JOHN W. LIEB 379

3—Report of Committee on Constitutional Amendments. FRANK W. FRUEAUFF 430

4—Vote on Constitutional Amendments 433

5—Report of Committee on Memorials. T. C. MARTIN. 438

6—Report of Committee on Resolutions. ARTHUR WILLIAMS 453

7—Report of Nominating Committee 457

8—Election of Officers 458

INDEX TO ADVERTISERS

	PAGE
American Cross-Arm Company	lvii
American District Steam Company	liv
Babcock & Wilcox Company	xxxvii
Benjamin Electric Manufacturing Company	xlvi
H. M. Byllesby & Company	lviii
Century Electric Company	lv
Henry L. Doherty & Company	lx
Electric Bond and Share Company	lxi
Electric Shop	xlix
Electric Storage Battery Company	xxxviii
Electrical Review and Western Electrician	lix
Electrical World	lix
Federal Sign System (Electric)	xxxix
Fort Wayne Electric Works	xlviii
General Electric Company	xli
General Electric Company	xlii
General Electric Company	xliii
General Electric Company	xlviii
General Electric Company	lvi
General Vehicle Company	lv
Habirshaw Wire Company	liv
J. A. Harney	lviii
Holophane Company	lvi
Indiana Rubber and Insulated Wire Company	xliv
H. W. Johns-Manville Company	lvi
Link-Belt Company	lvii
Metropolitan Engineering Company	xxxvi
National Cash Register Company	xlv
National Conduit and Cable Company	liii
National Quality Lamp Division	xliii
Okonite Company	xxxv
Otis Elevator Company	xl
William A. Pope	lxiv
John A. Roebling's Sons Company	liii
Simplex Electric Company	lii
Simplex Electric Heating Company	lii
Stone and Webster Engineering Corporation	lxii-lxiii
Weston Electrical Instrument Company	xlvii
Westinghouse Electric and Manufacturing Company	li
Westinghouse Machine Company	l

AUTHOR INDEX

WITH SYNOPSIS OF PAPERS

BLOOD, W. H., JR. *Report of the Insurance Expert:* It is gratifying to note that fire underwriters are giving more attention than formerly to the scientific rating of central stations, and that the operating companies are observing the underwriters' requirements more carefully. Liability insurance is at the present time in a chaotic condition. The State of Washington has recently passed a compensation law which is based on the theory that industry should bear the greater portion of the burden of the cost of its accidents. A scheme of inter-insurance has been worked out and put into effect at St. Louis. The work of the Committee on Grounding Secondaries is mentioned. The new specifications for rubber-covered wire have recently become effective, and it is too soon to judge the results. The assistance of the insurance expert is asked for many times each year, but too frequently the request is not made soon enough. 35 to 39

BRITTON, J. A. As a director of the Panama-Pacific International Exposition Company, Mr. Britton invited the Association to hold its convention of 1915 in San Francisco. 21 to 23

CANNON, W. B., Chairman. *Report of the Commission on Resuscitation from Electric Shock.* The commission is composed of representatives of the National Electric Light Association, the American Institute of Electrical Engineers and the American Medical Association. The report states the problems to be solved, and what has been done toward their solution. With regard to the best method of artificial respiration, the commission voted unanimously in favor of the Schafer, or prone-pressure, method. A chart and pocket-book of instructions concerning this method have been published. A sub-committee has been appointed to examine certain mechanical devices now on the market. 329 to 332

COTTERILL, HON. G. F. *Address of Welcome:* The Mayor of Seattle reviewed the rapid growth of the city, both commercially and numerically, and linked its development with that of the electrical art. He believes the city the best lighted in the world, and gave statistics to back up his statement. A most hearty welcome was extended to the delegates. 2 to 7

EDKINS, E. A. *Question Box Report:* In the eleven years since the *Question Box* was inaugurated, 3958 questions and 15,189 answers have been exchanged. The demands upon the time and energies of the editors are constantly increasing, and one of the greatest immediate needs is a revision of the classification. A tentative outline for revision is presented in an appendix. A card index similar to the one used during the past year is recommended as a permanent plan, in order to lighten the editorial work. Now that a permanent editorial staff has been arranged for, the editors recommend economizing space in the *Bulletin* by editing all material and making it as brief as possible.

Discussion by Hodge, Seaman, Jackson, Niesz, Ballard, Osgood, Parker. 160 to 175

Eglin, W. C. L. *Report of the Committee on Resuscitation from Electrical Shock:* The causes which led to the appointment of the joint committee known as the Commission on Resuscitation from Electric Shock are briefly reviewed. Then follows the formal report of the commission, stating the problems to be solved and what has been done toward their solution. 328 to 332

Freeman, W. W. *Report of the Committee on the Award of the Doherty Gold Medal.* 334

Frueauff, F. W., Chairman. *Report of the Committee on Constitutional Amendments.* 259, 430 to 433

Gilchrist, J. F. *Address of the President:* Much of the work of the Association is now continuous from one convention to another, accomplished largely by standing committees. To a considerable extent the individual "paper" has been supplanted by the committee report. Some committees have used the *Bulletin* of the Association for conveying advance information, and others have undertaken the compilation of a handbook. Growth in membership has been fair. The greatest effort should be made to increase the company, or Class A, membership. The administrative organization of the Association has expanded to such an extent that it has become necessary to employ an assistant to the Secretary. The *Bulletin*, with its *Question Box*, is growing in importance, and deserves a larger appropriation. After this year the work will be handled in the Secretary's office. The plan of inviting State associations to affiliate with the National Association is working out slowly. There has been much growth during the year in the Company Sections. The recommendation made in 1909 by President Eglin concerning more vice-presidents in the National Association is endorsed. The income of the Association is over $100,000 per annum. A reserve fund of at least $500,000 should be accumulated. It would also be most desirable for the Association to have a permanent building of its own. The Association has, in recent years, given much attention to the cultivation of cordial relations between central stations, the manufacturers and others following electrical pursuits. It is suggested that another relationship be cultivated, that between the Association and the various institutions of learning throughout the country. The relationship between the Association and the public service commissions is also a matter of decided importance. Municipal ownership is a subject in which the Association should take a more active interest. The report of the Public Policy Committee shows what has been done in this direction. Electricity rates have been studied for the past two years by a committee of the Association, and the time is close at hand when, on the initiative of the companies which form this Association, uniform rate systems must be put into effect. The electric-light securities of the country have a very clean record, and this should be jealously guarded by the Association and everyone in it. Welfare work for central-station employees is yearly becoming more common. The Association this year obtained the appointment of a body known as the Resuscitation Commission. The policy of the Association in taking the initiative in urging upon its members the adoption of the most modern ideas of broad and fair relationship between public-utility companies and the public is particularly commended. 8 to 20

Grant, H. E. *Educating Central-Station Employees:* A strong plea is made for the education of men and women for larger service in the central-station industry. Special efforts should be made by central stations so to train their employees that each will intuitively do the

right thing at the right time. Low operating cost is not a function of cheap labor in this industry. Education must necessarily be experimental, but with efficient supervision, regular meetings of the staff, the development of Company Sections and the organization of systematic study, successful training will be furthered. No company is so small that it cannot support its own bulletin. An appendix describes in detail the commercial school work of the New York Edison Company, which includes courses in the elements of central-station business-getting, hygiene, health, recreation, psychology, basic principles of salesmanship, and the scope, policies and organization of the company.
Discussion by Bludworthy, Stannard, Board, Learned, Mateer, Seaman, Graves, Gardiner, Williams. 336 to 359

Hild, F. W. An invitation to the members of the Convention to visit Portland and the Rose Festival. 265

Insull, Samuel. Presentation of the *Report of the Public Policy Committee.* 268 to 274

Lieb, J. W., **Jr.**, Chairman. *Report of the Committee on Street Lighting:* The report deals with both the economic and technical phases of street lighting. The history of the development of street-lighting equipment is briefly reviewed. The present tendency is to displace alternating-current series inclosed-arc lamps with luminous or with flame-arc lamps. Great impetus has been given to street lighting by the improvements in tungsten-filament lamps. The basis of comparison between different types of modern lamps is becoming the mean spherical candle-power. Tests have recently been made by a number of bodies, and the committee did not consider it wise to undertake any such work on its own account, but presents abstracts of the reports of these tests in the form of appendices to the report. The reports abstracted include the Colorado Springs case, the Waupaca, Wis., case, the Whitewater, Wis., case, the Sheboygan, Wis., case, and the Plymouth, Mass., case. In the investigation of street-lighting systems the following fundamental conditions should be considered: Character of street, pavement and surroundings; spacing, location, height and accessories of lamps; intensity and distribution of illumination, steadiness, glare and color. In street-lighting contracts vagueness is often present, and this should be corrected. Contracts ought to be so worded as not to prohibit the adoption of new illuminants as the art develops. 379 to 429

Lloyd, E. W., Chairman. *Report of the Rate Research Committee:* The committee found itself unable to reach a unanimous conclusion regarding the desirability of differential rates in residence business, but agreed that either a system which recognizes demand or a straight-line meter rate, with in some cases quantity discounts, is a proper one for small and residence business. Special work is being carried on by the committee in connection with the accumulation of information bearing upon the history of rates, court decisions relative to rate regulation, the history of government regulation, definitions, preparation of cases by companies in rate investigations, and the comparison of rates of various cities. The committee recommends that the systematic arrangement of rate terms and definitions be completed at the earliest date, so that there may be established through the Association an international code of rate terms and definitions. In addition to the recognition of some general rate-making policy among the member companies, it is desirable that the actual forms in which the rates are placed before the public should be as nearly alike as possible. All large customers should be charged on a schedule making separate and distinct demand and energy charges. For storage-battery charging, refrigeration, etc., lower rates can be made. It is for the best interest of all concerned that the rates permit the free renewal of standard lamps and the offering of other lamps at such low prices as to prevent dealers from competing with inferior lamps. The committee expresses its approval, for small consumers of commercial lighting or motor service, of either a block rate making separate demand and energy charges, based on electrical demand with a minimum, or a straight line or block rate carrying kilowatt-hour charges only, with a suitable minimum. For small consumers in the residential class, either a two-charge rate based on demand, with a minimum demand estimated on a floor area or room basis, or a straight line or block rate carrying kilowatt-hour charges only, with suitable minimum, is recommended. For very small residences the committee favors a demand rate based on controlled or limited demand. The rest of the report includes a list of proposed definitions of terms used in rate discussions, a recommendation that member companies file their rate schedules with the Association as soon as possible, and a set of recommendations as to the form and construction of rate schedules.

Discussion by Wallau, Williams, Josselyn, Lieb, Insull, Burnett, Graham, Junkersfeld, Ballard, Douglas, Graves. 184 to 253

LÜPKE, PAUL. *Expanded Loyalty:* Every honorable means should be used to promote the welfare of the central-station industry. That welfare depends primarily upon the loyal co-operation of all concerned. To create loyalty of the true kind the company that expects it must prove itself worthy of it. The employee has also his part to do. He must be an honest man, and he must, to the best of his ability, carry out the duties directly assigned to him. But the man who cannot and does not expand his loyalty beyond these two points is the rankest standpatter. All progress lies beyond his vision and comprehension, he is lucky if he can manage to stay where he is. The only way to get more pay for what you do is to do more than you get paid for. Loyalty to an employer sometimes means self-sacrifice, but it is worth while. Give full credit where it properly belongs, and stand up for a fellow employee who seems to suffer through misrepresentation. 177 to 182

MARTIN, T. C., Chairman. *Report of the Committee on Memorials.* 438 to 452

MARTIN, T. C. *Report of the Committee on Progress:* This report is divided into two parts, the first dealing with general progress and the second with energy transmission. Part I is a pamphlet of 120 pages and deals with all the important advances in the central-station industry. The opening section deals with general growth, and exhibits a total of 6406 central stations in the United States, Canada, Mexico and the American possessions on April 1, 1912. The following sections cover foreign comparisons; regulation and rates; municipal ownership and private competition; new stations and plants; general questions of illumination; electricity in agriculture; the larger uses of current; miscellaneous uses of current; general relations with the customer; relations with employees. 41 to 158

MARTIN, T. C., Secretary. *Report:* Statistics show the amount of detail work handled in the New York office of the Association. Out of an income of about $100,000, almost one-half is spent on the publications of the Association. The cost of the *Proceedings* during the past year amounted to nearly $20,000, to which must be added $7,000 for advance copies of papers and reports distributed at the New York convention. In order to reduce these expenses to a minimum, it is planned hereafter to subdivide the *Proceedings* into technical, commercial, accounting and transmission volumes. During the year 12,502 volumes of the *Proceedings* were printed, 2500 copies of the revised edition of the *Question Box* and 4000 copies of the Electrical Solicitor's Handbook, while for the convention of 1912 an edition of the Electrical Meterman's Handbook, a volume of nearly 1000 pages, was prepared. In addition, the Commercial Section brought out 2000 copies of the Commercial Digest, in loose-leaf form, and three pamphlets devoted to specific branch work, aggregating 35,000 copies. The Resuscitation Commission issued through the Association a chart and pamphlet, 1500 copies of which were printed for distribution at the convention. 29 to 33

MUNROE, C. A. *Desirability, as a Central-Station Load, of Pumping for Municipal Water-Works:* A population of more than 40,000,000 in this country is supplied by municipally owned water-works. If the load were handled electrically, at the average price of two cents per kilowatt-hour, the gross earnings of central stations each year would be about $14,880,000. In addition to automatic features of operation, the load can be dropped during the station peak without inconvenience to the town. The author recommends the use of a surface reservoir in addition to a standpipe, where water is pumped from deep wells, in order to decrease the head against which the deep-well pump has to operate and to give a large supply of water on the surface in case of fire. The making of contracts on a kilowatt-hour basis is advocated on the ground that contracts on a flat rate per 1000 gallons pumped tend to throw the cost of pumping-machinery repairs on the central station, render the latter responsible for the successful running of pumps in case of fire, and introduce complications in case the wells give out. 254 to 257

RUSHMORE, DAVID B. *Lecture on the Electrification of the Panama Canal.* 332

SCOTT, H. H., Chairman. *Report of the Committee on Membership:* Statistics are given of the present status of the organization, the membership of which totals 12,084. The membership is apportioned as follows Class A, 1134; Class B, 9725; Class C, 45; Class D, 240, and Class E, 940. During the year the gains in the respective classes have been as follows: Class A, 176; Class B, 3071; Class C, 26; Class D, 14; Class E, 132, making a total of 3419. During the year three Geographic Sections and nine new Company Sections have affiliated with the national body, so that there are now 10 Geographic Sections and 37 companies represented. 24 to 28

WHITNEY, W. R. *Some Uses of Metals:* This paper sketches the latest metallurgical advances of interest to the electrical industry, emphasizes the useful materials which have been formed in the alloy field and shows the mutual benefits enjoyed by the electrical art and new metal substances. Improvements in electrolytic refining methods have resulted in the production of practically pure copper. Impurities are fatal to the efficient use of this metal in electrical applications. Hardening agents increase the resistivity of copper to a prohibitive degree. By the use of boron copper may be cast of high conductivity, high density and freedom from blow-holes. Heavy castings, resistance grids, tool steels and many other materials used in the electrical industry require special grades of iron. Titanium, chromium, vanadium, molybdenum, thorium, uranium and zirconium are all finding useful places in the manufacturing field. Alloys of chromium with iron, nickel and manganese have superseded most other resistance material for heating devices, rheostates, etc. The possibilities of alloys of which iron is the chief constituent appear almost limitless in the electrical field. The entire industry is now tied to the silicon-iron alloy. Improvements in electric furnace methods make the possibilities with new alloys still greater.

Discussion by Bogardus, Stone. 366 to 378

WILLIAMS, ARTHUR, Chairman. *Report of the Public Policy Committee:* The committee calls attention to the growing unrest throughout the industrial world. The old order is undergoing change, and the result is reached by changing public opinion rather than by physical effort. Member companies are urged to eliminate on their part any conditions that lead to friction, criticism or a sense of injustice. The interests of the public are best served by regulated local monopolies. Monopoly enhances, not lessens, public accountability. Attention is called to the plan adopted by the Hydro-Electric Commission of Ontario, and the decision of the Kansas Public Utilities Commission in the Parsons case. There has been organized the Municipal Ownership Publishing Company, with offices in New York City. The company will maintain a library, issue a monthly publication, and provide carefully confirmed facts to writers, public officials, educational agencies and all others interested in the subject of municipal ownership. Several pages of the report are devoted to a description of the welfare work accomplished by several of the larger member companies during the past year. Attention is called to the recent movement to establish a minimum wage. Underpaid labor is undesirable in any industry, for under-nourished men and women are inefficient and their productive value cannot be so great as that of healthy and contented men and women. The subject of hygiene is receiving more and more attention, with marked results in the general welfare and contentment of employees. Safety of the worker is now an important consideration in many of the larger industrial establishments, many corporations employing a "safety engineer." The report concludes with a reference to the analysis presented in the appendix, by Mr. J. D. Craig, showing the cost of welfare work and co-operative insurance. The committee suggests the organization of a committee of trustees to act as a sort of clearing house, to assist the member companies in solving their problems connected with service annuities, co-operative insurance and welfare work. 274 to 326

GENERAL INDEX

PROCEEDINGS OF THE THIRTY-FIFTH CONVENTION, 1912

NOTE—In the Author Index will be found authors' names and synopses of papers and reports, the latter under names of chairmen.

A

Accident insurance, cost of. 291.
Agriculture, electricity in, report of committee on progress. 110.
Alaska, rare metals in. 377.
Alloys, metal. 366.
Amendments to the constitution, report. 259, 430.
American Medical Association, vote of thanks to. 332.
Annuities. *See* Welfare work, service annuities.
Arc lamps, new. 96.
Austria, central-station data. 52.
Automobile business, central-station experience. 117.
Automobiles
  amount invested in electric. 120.
  efficiency of electric, Chicago method of determining. 119.
  efficiency of gas and electric cars compared. 118.
  fire truck, Springfield, Mass. 120.

B

Bakery, electric, Milwaukee, Wis. 133.
Bankers, relation of, to electrical industry. 271.
Billings, Harriet,
  greeting to. 443.
  medal named after. 457.
Boilers
  combustion of gaseous fuel in boiler tube, work of Professor Bone. 86.
  tests of large water-tube, Delray plant of Detroit Edison Company. 84.
Bovey, H. T., obituary. 439.
Brixey, W. R., obituary. 438.
Bulletin of the association
  appropriation should be increased. 11.
  cover added. 29.
  development of. 30.
  handling of work in secretary's office. 11, 29.
  use of, by committees. 9.
Bulletins, company section, should be issued. 340.
Business getting
  isolated plants. 77.
  pumping for municipal water-works. 130, 254.
  St. Louis, isolated plants. 79.
  See also Automobile business; Commercial department.

C

Canadian Electrical Association, resolution concerning. 264.
Central-station business. *See* Business-getting; Commercial Department.
Central stations
  automobile business, experience. 117.
  cost of station per kilowatt. 46.
  evolution of central-station work, Steinmetz opinion. 80.
  foreign data and conditions. 48.
  Hartford, Conn., work of A. C. Dunham. 44.
  natural gas stations. 90.
  new stations and plants, progress report. 80.
  office buildings, handsome. 152.
  oil-burning plants. 91.
  power load, value of, report of committee on progress. 121.
  progress report. 42.
  summary of, by states. 47.
  technical improvements, report on progress. 45.
Coal
  storage of, under water, Omaha, Neb. 86.
  tests of, Birmingham, Ala. 93.
Cokefair, C. C., obituary. 440.
Colorado Springs lighting controversy. 394.
Commercial department
  customers, number of. 143.
  free fan service for the sick. 152.
  interesting and instructing customers. 149.
  loan of Pulmotor in Chicago. 152.
  relations with the customer. 143.
  wiring campaigns and the contractor. 144.
  See also Business getting.
Commercial section
  increase in growth. 25.
  offices in New York. 33.
  publications issued. 30.
Committee reports. *See* Report of committee.
Company membership in the association. 10.
Company section lecture bureau, explanation of proposed. 359.
Company sections
  bulletins should be issued. 340.
  importance of. 363.
  list of. 27.
  new sections. 25.
  president's address. 12.
  report of membership committee. 24.
  secretary's report. 31, 32.
Compensation law. *See* Insurance, liability.
Conservation.
  alleged "conservation" in New York State. 276.
  importance of subject to public policy committee. 272.
Constitutional amendments, report. 259, 430.
Contracts
  form of, for municipal water-works pumping. 255.
  street lighting. 390.
Conveyors for fruit, electric. 141.
Cooking, electric.
  cost of, family of six, for ten days. 134.
  report of committee on progress. 133.
Coolidge, T. J., Jr., obituary. 440.
Co-operation, president's address. 15.

Copper
  Alaska, possibilities in. 377.
  casting of, use of boron. 369.
  coating with alloy of aluminum. 369.
  production of pure. 368.
Cotterill, G. F., address of. 2.
Customers, general relations with. 143.

D

Death benefits. *See* Welfare work.
Dickey, D. D., obituary. 440.
Dodd, S. M., obituary. 441.
Doherty gold medal
  award to C. N. Duffy. 334.
  for 1913. 457.
Dunham, A. C.
  voted an honorary member of the association. 452.
  work at Hartford, Conn. 44.

E

Earnings, relative, of steam railroads, industrials, gas and electric utilities. 43.
Education of central-station employees. *See* Employees.
Education and instruction of central-station employees, committee on, proposed. 349, 352, 356.
Electric vehicles. *See* Automobiles.
Electrical industry, statistics. 42.
Electrical Meterman's Handbook, copies issued. 30.
Electrical Solicitors' Handbook, copies issued. 30.
Employees
  apprenticeship system. 357.
  British Columbia Electric Railway Company, commercial course. 339.
  classifying of the individual. 355.
  committee of the association in instruction and education, suggested. 349, 352, 356.
  Denver Gas and Electric Company, shifting of men. 348.
  education of, by central stations. 336.
  educational work of New York Edison Company. 156, 339, 340, 342, 351, 354.
  handbook for employees, Chicago. 156.
  hygienic conditions and results. 283.
  indemnity exchange system, St. Louis. 155.
  instruction and education, definition of terms. 351, 352.
  labor exchanges in England. 282.
  lecture system for special classes, suggested. 349.
  loyalty, expanded. 177.
  minimum wage. 282.
  National Cash Register Company. 353.
  New York Edison school. 156, 281, 339, 340, 342, 351, 354.
  Pacific Gas and Electric Company, meetings. 358.
  Philadelphia, examinations for meter testers. 350.
  physical education. 349.
  relations with, report of committee on progress. 154.
  safety of, work of corporations. 284.
  Sheldon School of Salesmanship. 353.
  shifting of men from one department to another. 347.

Employees—*Continued*
  Telluride Power Company, education at Telluride Institute. 348.
  trade school attended in relays. 347.
  tuition fees paid by some corporations. 347.
  underpaid labor. 283.
  See also Welfare work.
England, central-station data. 48.
Evans, J. H., obituary. 442.

F

Fan service, free, for the sick. 152.
Ferguson, Louis, resolution concerning. 33.
Financial statement for 1911. 260.
Fire insurance. *See* Insurance.
Fire truck, electric, Springfield, Mass. 120.
Fisher, L. D., obituary. 442.
Foreign central-station data and conditions. 48.
Furnaces, electric
  improvements. 374.
  possibilities. 376.

G

Generators, huge tubo-, New York and Chicago. 82.
Geographic sections
  list of. 27, 28.
  report of membership committee. 24, 27.
Germany, central-station data. 48.
Gilchrist, J. F., president
  address of. 8.
  publication of address recommended. 434.
  report of committee on address. 20, 433.
Government lamp suit. 106.
Great Britain, municipal ownership in. 71.
Grounding of secondaries, report of committee approved by Executive Session. 436.

H

Halsey, N. W., obituary. 443.
Haskins, C. D., obituary. 444.
Hawley, Edwin, obituary. 443.
Hazeltine, W. P., obituary. 443.
Heating, electric, report of committee on progress. 133.
Hebard, G. W., obituary. 445.
Hemingray, D. C., obituary. 445.

I

Ice making. *See* Refrigeration.
Illumination. *See* Lighting.
Incandescent lamp suit, government. 106.
Incandescent lamps, wire-drawn tungsten, superiority of. 104.
Incubators, electrical. 138.
Indemnity exchange system, St. Louis. 155.

Industrial installations, electric
  bakery, Milwaukee, Wis. 133.
  cotton gins. 124.
  laundries, 125.
  meats, curing of. 139.
  oil well pumps. 122.
  textile mills. 123.
  value of power load to the central station, report. 121.
  wood-working plants. 140.
Industrial unrest. 275.
Institutions of learning, relationship with the association. 15.
Insurance
  accident, cost. 291.
  fire, mutual electric railway insurance organization. 36.
  liability
    report of expert, 35.
    St. Louis, scheme of inter-insurance. 36.
    Washington's compensation law. 36.
  life, cost. 316.
  report of the expert. 35.
  sickness, cost. 296.
International exposition of 1915 at San Francisco. 21.
Irrigation and pumping, electricity in, report of committee on progress. 114.
Isolated plants, report of committee on progress. 77.

J

Jackets, electrically-heated. 103, 136.
Japan, central-station data. 53.

K

Kansas Public Utilities Commission, decision concerning competitive franchise at Parsons, Kan. 277, 321.

L

Labor, underpaid. 283.
Labor exchanges in England. 282.
Lamps, electric
  arc lamps, new. 96.
  incandescent lamp suit, government, 106.
  tungsten wire-drawn, superiority. 104.
Laundries, electricity in. 125.
Lecture bureau, company section, explanation of proposed. 359.
Life insurance, cost. 316.
Lighting
  interior illumination, report on progress. 109.
  report of committee on progress. 95.
  spectacular incandescent, St. Patrick's Cathedral, New York. 103.
  street
    Ann Arbor, Mich., concrete tungsten posts. 102.
    arc lamps, new. 96.
    Chicago, 97.
    Colorado Springs controversy, 394.
    comparison between types of lamps becoming the mean spherical candle-power. 384.

Lighting, street—*Continued*
  contracts. 390.
  digest of references to court and commission decisions. 427.
  Europe. 95.
  history of development. 380.
  investigation and testing of systems, fundamental considerations. 386.
  Philadelphia. 97.
  Plymouth, Mass., case. 422.
  posts, concrete tungsten, cost, Ann Arbor, Mich. 102.
  present situation. 383.
  report of committee. 379.
  Rochester, N. Y., magnetite versus tungsten lamps. 98.
  Seattle, Wash. 5, 6.
  Sheboygan, Wis., case. 420.
  Warren, Ohio, tungsten lighting. 101.
  Waupaca, Wis. 99, 400.
  Whitewater, Wis., case. 417.
Lignite producer gas, use of. 88.
Loyalty, expanded. 177.

M

McCormack, James, obituary. 446.
McGlensey, J. F., obituary. 447.
McNabb, B. G., obituary. 446.
Mather, Robert, obituary. 447.
Meats, curing by electricity. 139.
Medals
  Billings silver. 457.
  bronze and silver. 457.
  Doherty gold. 334, 457.
Membership
  company, need of increasing. 10.
  president's address. 9.
  report of committee. 24.
Memorials, report of committee. 438.
Metals, some uses of. 366.
Mix, E. W., obituary. 448.
Moffatt, G. B., obituary. 446.
Municipal ownership
  Cleveland, Ohio. 73.
  Galveston, Tex. 72.
  Great Britain. 71.
  Milwaukee, Wis. 72.
  Napanee, Ont. 74.
  president's address. 16.
  private competition and report on progress. 70
  Winnipeg, decisions of Manitoba Court. 74.
Municipal Ownership Publishing Company, library and work of. 278.

N

National Electric Lamp Company, dissolution. 106.
National Electric Light Association
  administrative organization, expansion. 11.
  amendments to the constitution, report. 259, 430.
  building, permanent. 14.
  committee in instruction and education of employees proposed. 349, 352, 356.

National Electric Light Association—*Continued*
  diplomas for central-station employees suggested. 340.
  election of officers. 458.
  financial statement for 1911. 260.
  great influence for good. 273.
  income and reserve fund. 13.
  lecture bureau proposed. 359.
  membership, report of committee. 24.
  New York office, details of work. 29.
  papers supplanted by committee reports. 8.
  proceedings, cost and sub-division. 30.
  publications issued. 30, 31.
  relations with institutions of learning and public service commissions. 15, 16.
  San Francisco and the convention of 1915. 21.
  secretary's assistant. 11, 29.
  secretary's report. 29.
  state association affiliation. 12.
  vice-presidents, more, recommended. 13.
  welcome to Seattle, Wash. 2.
Natural gas central stations. 90.
New York Edison school for central-station employees. 156, 281, 339, 340, 342, 351, 354.
Nominating committee
  election of. 263.
  report of. 457.

O

Office buildings of central-station companies. 152.
Officers of the association, election. 458.
Oil-burning plants. 91.
Oil well pumping, electric, cost, compared with steam. 122, 123.
Overhead line construction committee, changes in report. 435.

P

Panama Canal electrification. 332.
Panama-Pacific International Exposition Company. 21.
Parsons, Hinsdill, obituary. 449.
Parsons, Kansas, competitive franchise refused by Kansas Public Utilities Commission. 277, 321.
Paving by electricity. 140.
Platinum, in Alaska. 377.
Portland, Ore., and the rose festival. 265.
Posts, concrete, for tungsten clusters, cost, Ann Arbor, Mich. 102.
Power houses. *See* Central stations.
Power load, value of, to the central station, report of committee on progress. 121.
Power transmission section, sub-committee organized. 25.
President. *See* Gilchrist, J. F.
Proceedings, cost and sub-division. 30.
Profit sharing. *See* Welfare work.
Progress, report of committee. 41.
Public policy committee
  importance of interest in conservation. 272.
  presentation of report by Samuel Insull. 268.
  report. 268, 274.

Public service commissions
  California law. 54.
  Kansas, decision. 59.
  New Jersey, decision. 59.
  Ohio law. 55.
  progress report. 53.
  rate question, attitude toward. 188.
  relationship with the association. 16.
  results of commission rule. 56, 270.
  Wisconsin, results in. 56.
Public service corporations
  Kansas Commission's decision in refusing competitive franchise at Parsons. 277, 321.
  liability insurance at cost, St. Louis scheme. 36.
  monopoly and public regulation. 276.
  regulating, by public service commissions. 53.
  relations with the public. 16.
  report of public policy committee. 268, 274.
Puget Sound Traction, Light and Power Company. 266.
Pulmotor, loan of, by Commonwealth Edison Company. 152.
Pumping, electric
  central-station, for city water-works, report of progress committee. 130.
  central-station, for city water-works, value of load. 254.
  drainage along Illinois River. 132.
  Havana harbor, raising the "Maine." 132.
  irrigation. 114.
  oil well, costs of steam and electric drive compared. 122, 123.
Putnam, O. E., obituary. 449.

Q

Question Box
  classification scheme
    basic principles. 170.
    tentative. 162, 165.
  direct-by-mail service. 163.
  efficiency increased. 172, 173.
  growth, statistics. 160.
  handling of work in secretary's office. 29.
  indexing plan. 163.
  report. 160.
  revised, copies issued. 30.
  revision of classification. 161.
  staff correspondents. 163, 173.

R

Rate research committee
  report of. 184.
  secretary appointed and office opened. 187.
Rates
  active room demand basis. 231, 236, 238.
  Baltimore, Md. 244.
  Bangor, Me. 245.
  block system. 199, 230, 241.
  Brooklyn, N. Y. 252.
  bulletin issued each week by research committee. 188.
  Chicago. 69.

Rates—*Continued*
  Cincinnati, Ohio. 65.
  Cleveland, Ohio. 232.
  data accumulated by the association. 31.
  data, outline of necessary, for proper study of rates. 186.
  definitions of various methods of charging. 197.
  demand element in rate for small consumers. 193, 197.
  demand indicator basis, 233, 251.
  estimating maximum demand in residences, 238.
  floor area demand basis. 231, 236.
  international code, proposed establishment through the association. 188.
  lamp renewals. 190.
  large consumers, recommendations. 190.
  Los Angeles, Cal. 64, 248.
  maximum demand principle as a basis of charge given too much emphasis. 235.
  Milwaukee, Wis. 251.
  New York City. 67.
  New York Edison Company's systems. 236.
  president's address. 17.
  public service commissions, opportunity of the rate committee. 188.
  report of committee on progress. 62.
  report of rate research committee. 184.
  residential class of consumers. 193, 197, 230.
  St. Louis, Mo. 63.
  schedules
    form and construction of, recommendations by rate committee. 189, 199, 200, 207, 237, 244.
    issuing and filing of, with the association. 203.
  small consumers
    commercial. 191, 197.
    residential. 193, 197.
  straight demand rate using current-limiting device. 235.
  straight line system. 198, 230.
  taxation and rates. 68.
  Toledo, Ohio. 64.
  tungsten street lighting, Warren, Ohio. 101.
  two classes: one based upon averages, the other upon cost of service. 237, 242.
  two-rate demand system. 193, 198, 231.
Refrigeration
  Canton, Ohio. 126.
  central-station business. 126.
  Chicago. 129.
  combination ice plants, data. 126.
  energy consumption, Canton, Ohio. 126.
  Junction City, Kan. 127.
  Lexington, Ky. 128.
  O'Neill, Neb. 128.
  report of committee on progress. 126.
Regulation and rates, progress report. 53.
Report of committee on
  amendments to the constitution. 259, 430.
  grounding of secondaries, approved by Executive Session. 436.
  membership. 24.
  memorials. 438.
  nominations. 457.
  overhead line construction, changes. 435.
  president's address. 20, 433.

Report of committee on—*Continued*
  progress. 41.
  public policy. 268, 274.
  Question Box. 160.
  rates. 184.
  resolutions. 453.
  resuscitation from electric shock. 328.
  street lighting. 380.
Report of the insurance expert. 35.
Report of the secretary. 29.
Report of the treasurer. 260.
Resolution committee
  appointment. 263.
  report. 453.
Resuscitation commission
  appointment and objects. 19.
  members of. 154, 330, 332.
  report of. 329.
Resuscitation from electric shock
  mechanical devices. 331.
  problems stated. 331.
  report of commission. 328.
  Schafer, or prone-pressure method. 330, 331.
  Silvester method. 330, 331.
Ridlon, Frank, obituary. 450.
Russia, central-station data. 53.

S

Safety, industrial. 284.
Salesmanship, Sheldon School of. 353.
San Francisco and the international exposition of 1915. 21.
School of New York Edison Company for central-station employees. 156, 281, 339, 340, 342, 351.
Secretary's assistant employed. 11, 29.
Secretary's report. 29.
Securities, electrical, president's address. 18.
Service annuities. *See* Welfare work.
Sewage purification, electric. 140.
Sewall, Stephen A. 11, 29.
Sickness insurance. *See* Welfare work.
Silicon-iron alloy. 373.
State association affiliations with the association. 12, 31.
Statistics
  earnings, relative, of steam railroads, industrials, gas and electric utilities. 43.
  electrical industry. 42.
  financial. 42.
Street lighting. *See* Lighting.
Switzerland, central-station data. 51.

T

Textile mills, electricity in 123.
Trackless trolley. 142.
Treasurer's report. 260.
Tungsten
  Alaska field. 377.
  usefulness. 375.

Tungsten lamps, wire-drawn, superiority of. 104.
  See also Lighting, street.

V

Vapor lamps, report of progress committee. 107.

W

Wages. *See* Employees.
Water-works, central-station pumping
  report of progress committee. 130.
  value of load. 254.
Welfare work for employees
  accident insurance, cost of. 291.
  Baltimore, service annuity plan. 282, 326.
  Boston Edison Company. 279.
  Brooklyn Edison Company, profit sharing. 279.
  Byllesby & Company, investment club. 281.
  Cleveland Electric Company, employees fund. 280.
  Commonwealth Edison Company
    examinations of employees for tuberculosis. 283.
    service annuities. 279.
  co-operative insurance for small companies. 286.
  cost analysis, actuarial, by J. D. Craig. 285, 288.
  death benefit fund, Philadelphia Electric Company. 279.
  death benefits, cost. 296.
  hygienic conditions for employees. 283.
  life insurance, cost. 316.
  Milwaukee companies. 282.
  New York Edison Company school. 156, 281, 339, 340, 342, 351, 354.
  Philadelphia Electric Company, death benefit fund and service annuity plan. 279.
  president's address. 18.
  profit sharing, Brooklyn Edison Company. 279.
  report of public policy committee. 279.
  safety considerations. 284.
  service annuities
    Baltimore. 282, 326.
    Commonwealth Edison Company. 279.
    cost. 299.
    Philadelphia Electric Company. 279.
  sickness insurance and death benefits, cost. 296.
  Stone & Webster plans. 280.
Wiring
  central-station wiring campaigns and the contractor. 144.
  liability of company. 38.
  New York City, wooden mouldings prohibited. 37.
Wood-working plants, electricity in. 140.

X

X-ray work. 378

Y

Yakima Valley. 266.
Young, A. M., obituary. 450.
Young, C. I., obituary. 451.

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C. F. Scott

Underground Construction

W. L. Abbott, Chairman

H. B. Alverson
G. W. Cato
Burton French
S. J. Lisberger
A. S. Loizeaux
E. B. Meyer
P. Torchio
S. B. Way

Street Lighting

John W. Lieb, Jr., Chairman

Louis Bell
Alex. Dow
C. P. Steinmetz
R. F. Schuchardt

General Sessions

GENERAL SESSIONS

FIRST GENERAL SESSION—JUNE 11, 10 A. M.

1—Welcome to the City. G. F. COTTERILL, Mayor.

2—Address of President GILCHRIST.

3—Report of Committee on Organization of the Industry. H. H. SCOTT.

4—Report of Secretary. T. C. MARTIN.

5—Report of Insurance Expert. W. H. BLOOD, JR.

6—Report of Committee on Progress. T. C. MARTIN.

7—Report on *Question Box*. E. A. EDKINS.

8—Paper: "Expanded Loyalty." PAUL LÜPKE.

SECOND GENERAL SESSION—JUNE 12, 10 A. M.

1—Report of Rate Research Committee. E. W. LLOYD.

2—Paper: "The Desirability as a Central-Station Load of Pumping for Municipally Owned Water Works." CHAS. A. MUNROE.

EXECUTIVE SESSION—JUNE 12, 12.30 P. M.

1—Action on Report of Public Policy Committee. ARTHUR WILLIAMS.

2—Presentation of Proposed Constitutional Amendments. FRANK W. FRUEAUFF.

3—Report of Treasurer. GEORGE H. HARRIES.

4—Election of Nominating Committee.

PUBLIC POLICY SESSION—JUNE 12, 8.30 P. M.

1—Musical Program.

2—Reading of Report of Public Policy Committee. SAMUEL INSULL.

3—Report of Medical Commission on Resuscitation from Shock. W. C. L. EGLIN.

4—Lecture: "Electrification of the Panama Canal" (illustrated by lantern slides). D. B. RUSHMORE.

COMPANY SECTIONS SESSION—JUNE 13, 3 P. M.

1—Report of Committee on Award of Doherty Gold Medal. W. W. FREEMAN.

2—Paper: "Educating Central-Station Employees." H. E. GRANT.

3—Proposed Company Section Lecture Bureau. T. C. MARTIN.

4—Experience Meeting as to Company Section Work.

THIRD GENERAL SESSION AND EXECUTIVE SESSION—JUNE 13, 2.30 P. M.

1—Paper: "Some Uses of Metals." DR. W. R. WHITNEY.

2—Report of Committee on Street Lighting. JOHN W. LIEB.

3—Report of Committee on Constitutional Amendments. FRANK W. FRUEAUFF.

4—Vote on Constitutional Amendments.

5—Report of Committee on Memorials. T. C. MARTIN.

6—Report of Committee on Resolutions. ARTHUR WILLIAMS.

7—Report of Nominating Committee.

8—Election of Officers.

MINUTES

FIRST GENERAL SESSION

OPENING OF THE CONVENTION

The Thirty-fifth Convention of the National Electric Light Association was held at the State Armory, Seattle, Washington, June tenth, eleventh, twelfth and thirteenth, nineteen hundred and twelve.

TUESDAY MORNING, JUNE 11

President JOHN F. GILCHRIST, of Chicago, called the meeting to order at ten o'clock and introduced Mayor Cotterill, of Seattle.

ADDRESS OF MAYOR COTTERILL

I am sure it is a privilege for me to stand here this morning and in an official and in every personal way possible, to welcome you and yours to this city.

Out here on the Pacific Coast we have been endeavoring for a great many years to get the people of our country who travel, or who ought to travel, to become acquainted with our city. We have felt with the succeeding years that our effort is being more and more rewarded, and yet it is still an experience very common in our observation, how many, many people there are in our land who as yet have not become acquainted with what we believe to be the very best of America, the best of all the lands on earth. That old saying, "See America first," is being pretty well worked out these days, and you, with your various colored specials—I would not dare to try to enumerate them—have found during these last few days that all roads lead to Seattle; and if you don't find any road leading away from Seattle, we shall have no regrets. [Applause.]

I know that you are busy men, here on a business proposition, and yet along with the social inclinations I am sure you feel that it is worth at least a little time to know and to think of something concerning this place to which you have come. I shall not weary you, but a few thoughts may be at least entertaining, if not instructive, at this time.

Let me remind those of you who have not had occasion to study our census statistics that this city of Seattle, during the past decade, proved itself, with possibly the single exception of the city of Los Angeles, the most rapidly growing large city of the United States. From 1900 to 1910 this Seattle of ours expanded in population from 80,000 to 240,000—a threefold increase. [Applause.] And if I were to undertake to give you anything on the figures of increase in business and various other forms of expansion and development, they would exceed even these figures of the population. We believe there is a reason for this. I do not want to weary you, but just to suggest to you a thought along this line. From the very time of the discovery of America—indeed, the discovery of America itself arose from it—the desire of mankind in advancing civilization was to find that which was then called the Northwest Passage. Practically all the discoverers of the time of Columbus, and for at least a century following, were seeking to find some route to the riches of Cathay, and they bumped up against the American Continent. They kept striving to find ways through that continent by the northwest passages and down by the Isthmus, and finally, coming to the conclusion that there was a great continent here, civilization paused, and for two centuries or more developed in marvellous fashion that which has made America.

But I undertake to say to you here to-day that in this Puget Sound Harbor, this great arm of beauty coming in from the straits of Fuca, coming in to this magnificent American Mediterranean of Puget Sound, and with the iron-bound highways that have spanned the continent, some three or four of them directly to Puget Sound and others through Canada and to the southward having their immediate connections here, the Northwest Passage, in all that it originally implied as a tradeway of commerce, has been created, has been realized; and we believe it is no idle dream and no boom statement when we say to you that here in Seattle we are at the meeting point, the very cross roads, the vortex of the commerce of the continent and of the oceans. That is the ideal, the dream, if you please, that brought men and women to this city a quarter—yes, and a few of the pioneers a half—century ago; and it is on that basis and towards that result that we are building and this marvelous growth is going on.

With the completion of the Panama Canal in the near future, we believe, we know of almost untold possibilities which will center in their development around this city and the region that is tributary to it. We have been striving in this city to prepare for a great future.

You have had some opportunity to see, and I am glad to know that you will have more, for you don't purpose to work all the time; you believe that all work and no play is not good exercise at least; you don't purpose to be such dull boys as that; and during these few days that you will remain with us I know that you will see much more of that which we are striving to do to get ready here for a city, not merely of the quarter of a million or so that we have to-day, but the million and more that we have faith and the right to believe will be here in the not distant future. [Applause.]

I don't know that there is any body of men in our country to whom this idea of development, of increase in all that material progress implies, does appeal more than to those of you who are here to-day, who have, many of you, I am sure, been in this business of developing the electric lighting affairs of our country for the entire history of this art, if we may so call it. I need not remind you that we live in the most wonderful age of invention and progress that the world has ever seen. I know I should feel bad if anybody insinuated that I am getting old, and yet all of the progress from the very first of practical inventions along the line of the electric light and its development has come since my school days; and yet the marvel of its development and its progress is our constant thought. If anyone, for instance, could have come to the pioneer settlers of this Seattle of ours a quarter of a century, or, say, thirty years ago, and could have pointed to this hill which then existed in much higher contour, where the Washington Hotel, at or near which most of you are staying, now stands, if anyone had come and pointed to that forest-covered Denny Hill and said, "Within twenty-five or thirty years a stream up here in the Cascade Mountains will have been checked in its course; the power of the running and the falling water will have been harnessed; it will be brought thirty or forty miles to this spot; it will be attached to pumps and those pumps will draw the water from one of these lakes or from the Sound, and under that power and with that water great streams will be directed against the hill and it will be leveled, forty or fifty blocks of it reduced by some hundred feet or more and made available for the expansion of a great city." If anybody had ventured such a thought as that twenty-five or thirty years ago, kind friends would have taken hold of him and removed him to some place where he could be tenderly taken care of. And yet, as you know, that is just exactly what has happened here. And similar great schemes of development have been worked out all over our land.

Truly, it is good to live in an age when so much is doing, to use the slang phrase of the day, so much in which we have some part.

I want to remind you that here in this city of ours we believe it is a privilege to live in a spot where commerce has these great opportunities, and we believe we have a right to say that there is no city of commercial opportunities on earth that has such a setting of landscape beauty about it. If you were to take a square of, say, fifty miles north and south, east and west from this city of ours, you would include a landscape with the magnificent Cascade Mountains on the eastern border, the Olympics on the west, and enclosed between them this American Mediterranean with all its ramifications of indented shore line, its beauties and its commercial opportunities combined, its lakes, rivers, islands and peninsulas—altogether a scene of beauty which we believe would make this spot a mecca for the sightseers and tourists of our land if there were here no commercial opportunities. We are glad that for these few days even you are to be with us. We hope that you will have leisure, as I am sure you will have an inclination, to see something of the beauties that surround us.

I would like to tell you of the grand rivers that come coursing down these mountains, but I am afraid if I did that you would desert this hall and be out hunting water rights. [Laughter.] Lest anything of that kind may be in your minds, let me tell you that some of us are inclined to believe that all which have not already been taken have been included by a kindly and paternal government in the forest reserves for future generations. [Laughter.]

I can never forget some twenty-five years ago when a transit man on one of the railroad engineering parties working to the eastward of this city, one January morning when there had been snow, sleet and rain and all had frozen upon the beautiful evergreens. The lines we were running came out within sight of a spectacle which for beauty I am sure has never been equalled since. We were upon that spot where Snoqualmie Falls in all its original beauty tumbles over a cliff of rocks two hundred and eighty feet or so to the great pool below. If anyone had said then that within a very few years our city would be lighted, our people would be served in many ways, by the harnessing of those beautiful falls, it would have seemed idle talk. You have the privilege, as at least one of the excursions are going to that spot, of seeing what is left of the beautiful Snoqualmie Falls.

I want to welcome you, gentlemen, to a city that we believe we have a right to say is the best-lighted city in America, and, I think it might be added, in the world. [Applause.] I read in the beautiful little booklet which our Philistine friend, Elbert

Hubbard, prepared as something of a souvenir of your journey to Seattle, the statement that our sister city of Los Angeles has eight hundred and thirty of these cluster lights; that is, lights on stands or poles. Now, without desiring to weary you with figures, I thought that at least on this point you would be glad to have exact information as to Seattle, and I have secured them from our Superintendent, Mr. Ross, and give them to you very briefly.

We have 1116 of the five-lamp, 378 of the three-lamp standards, and 137 single lamps of that type, or a total of 1631; practically twice the number of which Los Angeles boasts. There are twenty-five miles of our business streets lighted by this most modern method of street illumination. In addition to that we have 700 arc lights, 210 of the 300-c.p. tungstens, and 5315 of the 40-c.p. tungstens, making a total of somewhere in the vicinity of 8000 street lamps of the various types, illuminating its hills, its valleys and its business streets in a manner of which I believe we are right to be proud. Eight hundred and thirty thousand candle-power is the sum total of the street illumination of the city of Seattle, with its 500 miles of residence and business streets. The cluster lamps require approximately 275,000 of that candle-power; or, in other words, about one-third of the total candle-power is applied to 25 miles or one-tenth of the street mileage in the city.

I thought that these figures might be interesting to you. We believe that by making our city light we are increasing our safety, aiding our police force, and adding to our pleasure, comfort and convenience; while at the same time in making use of these God-given, man-developed opportunities to make our city attractive, we display a very real spirit of progress, a spirit that stands for development. [Applause.]

I would not, certainly at this time, make any statement that could cause controversy; I merely mention the fact that we are proud that this great system has been developed by and belongs to our city. You will be glad to know that working side by side with us and our municipal plant is the great system in all its various ramifications of light, street railways and power of the Puget Sound Traction and Development Company, which I am assured by its managers has done, and is still doing, much for your comfort and pleasure.

It is fine to feel that a city and a competing private corporation can live together as good neighbors in this common city of ours. I well recall that some four or five years ago while there were conditions of freezing at one of the sources of supply of the private company, on some four or five occasions our city was able to come to the assistance of the other company by furnishing needed power; and that was very kindly reciprocated and gratefully received when, during our period of construction and expansion last fall, a similar temporary disaster came to us. We have proved ourselves ready, the one and the other, to furnish to each other in time of need that which our common community demands and has a right to have in the way of daily service. [Applause.]

It is to this city, gentlemen, that I am glad, as its Mayor, to welcome you. We know that our city will receive good from your coming here. We know that you will be bigger, greater, truer Americans for having seen this portion of your land. Whether you remain in your old home communities or succumb to a desire to return and grow up with the West—in one place or the other you will always have a good word for Seattle, and we are glad to welcome you, knowing that that will be the spirit with which you will leave us, as it is the spirit with which you have come to us.

I bid this Association God-speed in its great work of developing this wonderful and mysterious natural element or force which has done so much for us, yet which we understand so little. From that great first day of creation, when, as the Scriptures tell us, darkness was over the deep and the spirit of God moved upon the face of the water and God said, "Let there be light and there was light"—from that time to the present, men and women have been seeking light, more light, literally, physically, figuratively. Truly it is God's wonderful gift to us, and every man who is loyally, earnestly interested in developing this great agency and bringing it to the service of mankind, adding it to the health and progress of our day, is doing a work of which he need never be ashamed and to which he should bring the highest talents with which humanity is endowed.

I welcome you, gentlemen, to the city of Seattle. [Loud and prolonged applause.]

THE PRESIDENT: I am sure that your applause is an indication of appreciation of Mayor Cotterill's eloquent address. I will ask Mr. Tait to please take the chair.

ADDRESS OF PRESIDENT GILCHRIST

Another year has rolled around since this meeting was last called to order by President Freeman in the Engineering Building, New York City, in May, 1911. It has been a year of growth and progress in the business of generating and distributing electricity, and of some development and fair outputs and sales in the kindred industries of manufacturing, selling and installing electrical apparatus and wares. The National Electric Light Association has, we believe, kept fully abreast of this development, and its activities have been in keeping with the general activities of the business.

The advantages resulting from improved load-factor, which are everywhere admitted, have been impressed on recent administrations with the result that Association work is distributed throughout the year to a much greater extent than was formerly the case. Then, few meetings of the Executive Committee were held and very little activity was noticeable until a few months prior to the annual Convention. Now, a surprisingly large number of standing committees are appointed and at work in the early fall, and to at least the four or five hundred men in the work, either as members of committees or officers of the main and affiliated bodies, the work appears decidedly and continuously active from one general Convention to another.

A further evidence of the influence of the growth of the Association and of the modern idea appears in recent programs. Formerly the "paper" prepared and presented by the individual predominated. Now, similar information is conveyed to us by means of a Committee report, the result of the deliberations of a group of men carefully selected with a view to getting together those who, by training and experience, are best fitted to give the most reliable opinions on the subject under discussion. This year sees no change from recent ones in this respect; in fact, the work has been carried out along this line to a greater extent than ever before. The benefits are reciprocal—men working on the committees get as much as they give. The association with others in their own special work, and the broadened view and enthusiasm secured, should be and are highly prized by the individual and by the company he represents, and, on the other hand, the Association and the industry at large secure well-digested opinions of great reliability and practical value.

Besides the reports submitted to the Convention, some of the Committees have used the Monthly *Bulletin* to excellent advantage in conveying advance information to the membership, and others have undertaken the compilation in handbook form of the detailed data and general information which they have gathered in the course of their investigations. This line of contemplation results in a full appreciation of the value of the committee work and the desirability of placing on the Association's committees the very ablest men in their particular branches of the business who are willing to give their time to Committee work, and to support them by placing at their disposal such reasonable funds as may be necessary to employ investigators and secretaries, and in other ways enable them by consultation and supervision to prepare and submit the most valuable reports possible. When eight or ten busy men of distinction in their branches are willing to give their time and thought to such conference, they are making most valuable contributions to the industry, and should be so assisted that no portion of the benefit will be lost.

I wish to direct attention particularly to the very high character of this year's committee reports, and to personally thank the Chairmen and members of these committees for the very excellent work that has been done. There is a growing coterie of men to whom the Association is indebted for work of this class, and it would seem as though close familiarity with the affairs of the Society is all that is necessary to develop the most earnest working supporters. This theory is demonstrated by the fact that in this structure for the protection and furtherance of the industry, the Past-Presidents are the most important pillars, always willing to sacrifice personal time and interests to the Association work.

GROWTH IN MEMBERSHIP

During the past year the growth in membership has been fair. There are those in the Society whose opinions always have weight who are inclined to question the advantage of continuing to expand the membership, but I believe a large majority of those who have given serious thought to the matter believe that it will be desirable to go on for a long time yet. There may be a few cases where the growth has been forced too rapidly, but for every case of this kind there are a hundred where there has been no development at all.

Under the headway which it has obtained, Class B membership will, I believe, continue to extend rapidly, not only as a result of the formation of Company Sections, but on account of an increasing desire on the part of individuals in the business to participate in the membership and get the advantage of the publications. The greatest effort, however, should be in increasing the company, or Class A, membership. There seems to be much difficulty in attracting to the Association the very companies which would derive the most benefit from it. Some way should be found to interest these people and show them that they can for a very small amount of money obtain advice and opinions along engineering, organization and commercial lines which would cost them many hundred times the membership fee if they went out to purchase such advice commercially.

Some method should be found to impress upon them the fact that the Association is intended for all companies, large and small alike; that the benefits are greater, in proportion, to the small company than to the large, and that representatives of the small companies are earnestly desired on all of the committees and in all of their work.

But, notwithstanding the apathy of this class of companies, the general interest demands that their affiliation be secured. It would be well to organize a State committee of twenty-five to fifty active men, under a vigorous and enthusiastic head, in each one of the States. The Chairmen of these State committees would form the general Committee on Organization of the Industry; then the eligibles in each State should be apportioned among the committeemen in that State, these committeemen to be given the authority to enlist the assistance of the company members in the neighborhood. In this way, by the personal work of the local people, it should be possible to largely increase the Class A membership. In addition to this, the time has come when the Committee on Organization should be authorized to employ a traveling representative of the Association who should visit as many non-member companies as possible each year for the purpose of laying before them, personally, the advantages of membership, and receiving suggestions and criticisms.

ADMINISTRATIVE ORGANIZATION

The Administrative Organization of your Association has been expanding with the growth, and it is desirable that this expansion continue. In this line your Executive Committee has, during the year, authorized the employment, as an assistant to Mr. Martin, of Mr. Sewall, a man whose qualifications seem to fit him particularly well for the position. The plan of affiliating State, Geographical and Company Sections has demonstrated that it is very desirable to have the general officers of the Association very much in evidence throughout the year as guests at the meetings of these various branches, thus maintaining the interest and enthusiasm necessary in such work. To have the Secretary sufficiently free to devote the necessary time to this class of work is exceedingly desirable. The new arrangement will make this possible without neglecting the growing amount of Executive and detail work incident to the rapidly increasing size of the Association.

BULLETIN AND QUESTION BOX

The Monthly *Bulletin,* with which you are all familiar, and which has become a feature of the Association, is growing yearly in importance. A most useful department of this *Bulletin* is the *Question Box*. I would commend both the *Bulletin* and the *Question Box* to your very thoughtful attention. It seems to me that the Association may most profitably increase the appropriation necessary for this work from time to time. There is no doubt as to its very great usefulness at the present time, and it would seem that it has sufficient possibilities and may be of such great value to so large a percentage of the membership that the expense of making it larger each year would be thoroughly warranted. In the past the *Question Box* has been edited by volunteer editors, supplied through the generosity of member companies. This work is getting to be too much of a tax on any one company and it is expected that after this year it will be handled in the Secretary's office.

ORGANIZATION

The plan of inviting State Associations to affiliate with the National Association is working out slowly. During the year the Northwest Association, comprising several of the States in this section of the country, the Michigan Electrical Association and the Iowa Association, have voted to affiliate and have been taken in. This movement is a little slow, but the results are satisfactory. The Presidents of the different affiliated associations, as *ex officio* members of the Executive Committee, have a voice in the management of the parent Association, and their respective associations became a part of the National body in fact as well as in name and membership.

The time will come when the entire industry will in this way be brought together. The conventions of these affiliated associations stand high in the character of the work they do, and in many cases are as large as the National was a very few years ago. The fact that the delegates are generally very well acquainted with each other is apparently responsible for the most desirable kind of discussion, and leads to the query as to whether or not in the future the best literary and scientific work of the Association may be done in these State Conventions; while the National will have become more of an executive meeting, composed chiefly of the regularly constituted delegates from the affiliated associations.

The scheme of the organization at present provides for Company Sections, State and Geographical Sections, and the parent Association. The question has been raised as to whether or not there should be some form of section between the Company Section and the State Association. The demand seemed to come principally from the desire on the part of companies in some of the larger centers to hold meetings which Class D and E members, as well as Class A and B members, in a community may attend.

COMPANY SECTIONS

There has been much growth during the year in the Company Sections. There have been a few new sections formed, but the growth has been principally due to the accession of a large number of members to the older sections. A considerable personal knowledge of the results secured in such sections leads the speaker to the conclusion that this work should be encouraged and extended as much as possible. Very few companies are too small to find a Company Section practicable. The experience of those companies which have been pioneers in the movement would indicate that nothing has done so much for the Association since it was first organized as this Company Section movement, which brings the whole body of the employees in touch with Association work, impresses them with their individual responsibilities, and through them creates an influence in the community which affords the greatest possible protection by establishing good-will and a public sentiment in favor of the corporation, which cannot be so well secured in any other way. The company which does not promote a Company Section within its ranks is denying itself and its employees a great deal of benefit which has a very decided money value.

VICE-PRESIDENTS

In connection with the question of organization, I would call your attention to a recommendation made in 1909 by President Eglin in his opening address, which was that more Vice-Presidencies in the parent Association be created. I wish to endorse this recommendation. I believe that the different sections of the country should be recognized in the National Electric Light Association; that there should be at least four Vice-Presidents instead of two, as at present.

INCOME AND FUNDS

The income of this Association has naturally increased with the membership. The income at the present time from all sources is somewhat over one hundred thousand dollars per annum, but is hardly ample for the necessities of the organization, as it is desirable to lay aside a certain amount each year for the purpose of accumulating a Reserve Fund. It has not been possible to do this every year. Some little time ago the Association started such a fund, and it has at the present time fifteen thousand dollars invested in securities. It is a question, however, on last analysis, whether or not this is a real reserve.

While a very large sum of money in a Reserve Fund may not be necessary or desirable, and may even prove an embarrassment, an association of the size of this one, representing the very large interests which it does, should have a fund of at least a half million dollars well invested which would insure an income over and above that derived from other sources of from twenty to twenty-five thousand dollars a year. Such resources would give the Association greater standing and would put it in a position to take up in emergency almost any work which might present itself. When one stops to consider that from three to four hundred thousand dollars is spent by the members of the Association in attending a single convention, and that this does not include the value of the time of the delegates, but their out-of-pocket expense only, it does not seem an extravagant sum to have always on hand by an association which exists for the advancement and protection of an industry which employs between fifteen hundred and two thousand millions of dollars of capital. This fund should be in the hands of the Finance Committee of the Association.

A very slight effort for a few years would result in its accumulation and the Association would thereby be placed in a position to take up promptly almost any matter which might be necessary in the interests of its members, while the application of the yearly income to study and development outside of the ordinary routine of Association work might be of incalculable benefit to the members.

Another matter of live importance which should be shortly attracting the attention of the Association is that of a suitable and permanent building of its own. This would be very desirable as a means of securing the prominence which is necessary to enable the Association to carry out the purposes for which it exists, even if it were not necessary for the more practical reason of affording proper accommodations for the organization which has grown rapidly during the past decade and which, if it keeps pace with the industry, must go ahead much more rapidly in the future. I know of nothing which would be more effective in giving tangible indication of our strength than such a move.

There would be very many advantages in locating this building in New York City, as that seems to be a point to which it is possible to get men from all parts of the country to go with less difficulty than to any other place, but the location of such permanent headquarters should be very carefully considered. A city nearer the present center of population might seem a more reasonable place from the point of the entire membership; or, on the other hand, there might be very decided advantages, in line with a suggestion which has been made, in establishing our own building in the National Capital. I leave this question to your very careful consideration.

CO-OPERATION

The Association has in recent years given much attention to the cultivating of most cordial relations between the central stations, the manufacturers from whom they purchase and all those following electrical pursuits. There are a very large number of people in the country in our work who have apparently only recently awakened to a realization of the fact that there is a great mutuality of interest among all the people engaged in any way in electrical businesses. It is earnestly hoped by the speaker that the policy of this Association may be one of taking the initiative in the development of the closest union and most cordial feeling between the men and companies interested in all branches of electrical work.

RELATIONS WITH INSTITUTIONS OF LEARNING

This suggests another relationship which has not been cultivated in the past to the extent that it should be in the future, and that is the relationship between the National Electric Light Association and the various institutions of learning throughout the country. Not only is it important from the point of view of having men properly educated to prosecute our business and operate our undertakings, to get in closer touch with the curriculum of such institutions as deal with the technical education of young men, but it is also desirable, by mutual acquaintance, to appreciate each other's point of view, in order that the rising generation may have broad, practical ideas regarding many of the great questions which are puzzling this country to-day; and, particularly, fair views regarding the formation and operation of corporations—most especially public utility corporations. A standing committee on relations with institutions of learning would, in the estimation of the speaker, be most desirable.

PUBLIC SERVICE COMMISSIONS

Still another relationship which it would be desirable for this Association to cultivate would be with the Public Service Commissions of the country. Such relationship would be best handled by, or under the direction of, the Public Policy Committee, but it is a matter of decided importance. While at the present time comparatively few of our States have established such commissions, they are increasing in number yearly. It is just to conclude that the men on these commissions are earnestly desirous of arbitrating fairly between the public utilities over which they are given authority and the people, but naturally they lack experience in our industry, and this Association, without compromising its position as the bulwark of the rights of the central-station business, should maintain toward commissions an attitude of cordial and friendly co-operation in arriving at what is right and fair in contentions between public service corporations and the public. It should at all times be the aim of our Association to promote harmony and good feeling among all of the interests in our business, thereby obtaining the strength of real unity; and the protection of the Association should be extended particularly to the owners of small properties who may be involved in difficulties which are trying to their resources. However, in this connection attention should be given, where cases come to our notice, to the methods of small companies, and any practises which are not consistent with the established ethics of the business should be vigorously frowned upon.

MUNICIPAL OWNERSHIP

The tide of public opinion with regard to this question seems to ebb and flow. Six or seven years ago it seemed to be at the flood. This was followed apparently by a decided revulsion of approval to municipal ownership of utilities, but recently the municipal idea seems again to be popular. Political expediency and the self-interest of a certain proportion of the public will probably always be decided factors in this discussion, but these elements should be overcome and the question dealt with from the standpoint of the "greatest good to the greatest number" of people. If this problem is set forth intelligently, I believe it can be shown that under the conditions existing to-day in the world, and particularly in this country, better service can be rendered at the same price, or the same service at a lower price, in all branches of public utility work by privately owned corporations than by municipally owned ones. The difficulty which confronts us is that of making an intelligent comparison.

Apparently at the present time one decided cause of the increase in municipally owned plants is that many short-sighted owners of small properties, who have themselves not been able to operate successfully, have deliberately gone into the business of unloading their properties on the municipalities. Another important element in the increase of small municipal plants is the fact that in many small towns those in charge of the waterworks are using their influence to have electric plants established in connection with the water plant. This in itself is no doubt fundamentally economical, but far-sightedness on the part of central-station people should result in an arrangement by which the privately owned company could take over the operation of the water system, or at least provide the power for doing the pumping. Centralization of every supply is in the direction of economy, and no central station should rest while there is any possibility of gathering in these allied activities.

The Association has very important work to do in this connection. The report of our Public Policy Committee will show how alive it is to this situation and the good work which it has taken up in this connection.

ELECTRICAL RATES

This Association has for two years past had a Committee making a careful study of electricity rates. The question of rates is one which has occupied a great deal of the attention of electrical people since the business was inaugurated, and while rate schedules have been established very generally which on analysis are quite similar in results, there is a deplorable lack of uniformity in the schedules themselves.

The question of rates is naturally one of paramount importance in the minds of public service commissions. At the present time these commissions are in many instances studying the question themselves, but have not felt sufficiently sure of their position to take any radical steps. This is very rational and conservative, but the time is close at hand when, on the initiative of the companies which form this Association, uniform rate systems must be put into effect.

I especially commend to the attention of the Convention the report of this year's committee, and I hope that a full appreciation of the importance of this matter may result in the endorsement of some uniform practise in the matter of rates. As in the case of our accounting, this would be gradually adopted within the next few years, and it would be recognized that there is decided uniformity among the companies in this respect.

ELECTRICAL SECURITIES

A growing amount of attention has been given during the year to the desirability of protecting the good name of Central-Station securities. The importance of this to the continued growth of the industry needs no emphasis. On the whole, the electric-light securities of the country have a very clean record and this should be very jealously guarded by the Association and everyone in it.

We have recently been passing through an era of great prosperity in the development of all these properties, and there are no indications that the growth will not continue for a long time before it catches up with or exceeds the growth of general business and population in the country, but it should be borne in mind that the elements which drown out mistakes and bring successes out of apparent failures may change, and no corporation or group of men should, without the protest of this Association, be allowed to carry the promotion of business to a point where a halt or recession in general business would result in losses which might have serious effect upon the whole line of Electrical Investments.

WELFARE WORK

Stimulated by last year's report of the Public Policy Committee a great deal of interest has been shown in plans for increasing the welfare of central-station company employees. Employees' clubs, saving and investment plans, pension schemes, athletic events, entertainments, the attendance of physicians and visiting nurses, and similar arrangements for the health, pleasure and general welfare of employees are becoming yearly more common.

Somewhat in line with this class of work the Association has been fortunate this year in obtaining the appointment of a body known as the Resuscitation Commission. The object of this commission is to study the effect of electrical shock upon the human system in order to treat more intelligently and successfully cases of this kind; also to revise and prepare for publication rules and diagrams which will result in the application of first-aid methods in accordance with the most up-to-date practises. While modern precautions and safeguards have decidedly reduced the number of cases of this sort in proportion to the increase in the use of high-tension energy, it is universally admitted that no effort should be spared to hold the loss of life at the lowest possible point. This Commission consists of the most eminent medical and electrical men. We have for exhibition here some of the first fruits of their deliberations, and we hope that their earnest and enthusiastic work may prove of great benefit in this direction.

Your President wishes to take this opportunity to thank these gentlemen, and the American Medical Association and the American Institute of Electrical Engineers for their cordial and hearty co-operation in this matter.

In concluding this address I would particularly commend the policy of the Association in taking the initiative from the standpoint of good business, as well as good ethics, in urging upon its members the adoption of the most modern ideas of broad and fair relationship between public utility companies and the public. This is no new idea in highly competitive business, where the success or failure of an undertaking depends directly upon the acceptability or lack of acceptability of its service to its patrons. Great merchandizing concerns have always recognized this truth, and much more should it be recognized in the case of public utility corporations dealing with a public, which, as contributors of certain rights and benefits vital to the conduct of the business, become in a sense partners in the business; and for this reason, and also because of the factors which determine that in the interest of economy our business should be a monopoly, the public has a right to expect much greater consideration than would be given by private enterprise. If this Association can hasten the adoption of broad and intelligent policies in the conduct of the business of all its member companies, it will have accomplished a work of sufficient importance to pay for its existence if it never accomplishes anything else:

In conclusion, I wish to take the opportunity to express, both officially and personally, my thanks for and appreciation of all of the work of the officers, officials and committees of the Association during the year. Particularly are thanks due to those member companies who, through their representatives, have so cheerfully and effectively contributed of their brains, time and money to the work of the Association; to the chairmen and members of all committees that have accomplished such excellent work, especially those committees on Transportation, Exhibition, Entertainment and General Arrangement, which, while they have not made reports on paper, have done so much to add to our comfort and pleasure; and, finally, to our Secretary and his staff, who have been untiring in the work of the Association—all of which work will, I trust, result in a very satisfactory Convention.

VICE-PRESIDENT TAIT: It is customary for the Chairman of the first meeting of the Convention to appoint a committee of three members of this Association to consider the President's address, and with your permission I would like to appoint that committee now. I will name Mr. W. C. L. Eglin, of Philadelphia; Mr. J. E. Davidson, of Portland, Oregon, and Mr. R. H. Ballard, of Los Angeles, California, and ask these gentlemen, after very carefully considering the President's address, to make, at the proper time, such recommendations to this Convention as they deem necessary.

THE PRESIDENT: All of you gentlemen who know San Francisco, especially by your recent experience, know of the hospitality, energy and enterprise of the people of that city. I want to call upon a gentleman in this room who comes from San Francisco, whom I know it would be a pleasure for all of us to hear. I think that we ought to have an opportunity to express to him, so that he may carry it back to the San Francisco people, some appreciation of what they and their neighbors down the coast have done for us at this Convention. I refer to Mr. John A. Britton, Senior Vice-President of the Pacific Gas and Electric Company, and also a director of the Panama-Pacific International Exposition Company. I think, aside from some words of greeting, Mr. Britton may have a message for us.

Mr. Britton: I appreciate fully the compliment conveyed by permitting me, as an humble representative of San Francisco, to take up your time for a few moments with the message that your President has suggested I may have for you; and, dissociating myself for the moment from my position as a delegate to this Convention, and assuming the roll of a director of the Panama-Pacific International Exposition Company, I come to you with that message which has sounded in clarion tones from one end of the earth to the other in the last few months; and that message is that San Francisco invites the world in nineteen hundred and fifteen. [Applause.]

Mind you, in saying that, San Francisco is not assuming the attitude of being the host for the world; it is assuming merely to be a representative of all of the United States of America; it feels, although it has been chosen by Congress to represent the United States in the commemoration of the greatest engineering feat ever completed by man, that it merely represents the congregation of the States, and that you who reside east of the Sierra Nevada Mountains, and even those who reside in our possessions in the far Pacific, are to be just as much the host to the nations of the world as San Francisco itself; and in that I want to commend to your attention the absolute unselfishness of San Francisco.

After listening to the very stirring address of the Mayor of this city, my only wonder is that Seattle was not chosen to represent the opening of the Panama-Pacific Canal. You might have observed that the Mayor jumped, with his hundred-thousand league boots, from the shores of Puget Sound to the orange vales of Los Angeles, but you observed particularly he did not mention San Francisco in his travels. [Laughter.] But we are on the map and we are making our influence felt, from even Seattle to Los Angeles.

Now we believe that California itself possesses an inherited right to the commemoration of the opening of the canal and also the inherent right to send to the National Electric Light

Association the message to hold its convention in San Francisco in nineteen hundred and fifteen. [Applause.] Representing as you do that industry so poetically described by Mayor Cotterill, you must bear in mind that California was the pioneer in the development not only of central-station operations, but of hydro-electric operations. For in Southern California, in Redlands, was first tried out the transmission of electric energy at the then extreme voltage of eleven thousand, by transformers connected in series. The first purely hydro-electric transmission line was built on the American River, near the town of Folsom, and brought into the gates of the city of Sacramento; and from that simple beginning has developed the science and industry as it stands to-day, the wonder of the world.

We of San Francisco possessing the finest harbor in the world, bar none, abounding in the scenic beauty of hills and vales, with mountains snow-capped on our eastern extremity and with the broad Pacific Ocean coming from the Orient on the west, believe that our city has a potential fitness for expositions that not even the wonderful scenery and possibilities of Puget Sound can equal or excel. [Laughter and Applause.] And we want you to come there in 1915 for a few days of learned discussions of the prodigious things that will be done between now and then; and for many pleasant days and weeks of sight-seeing among our valleys and great rivers that run from the melted snow to the seas and, running, grind out that energy that moves the world. We will show you there a city rebuilt after such destruction as the world had never witnessed before. Sphinx-like, it has risen from its ashes of six years ago, and to-day occupies a place in the commerce of the world that even our brethren in the East admire and applaud. And we of the Pacific Coast, fronting upon an ocean whose Oriental trade we invite and through whose Golden Gate will pour hundreds and thousands of poor peasants of the East to be raised from poverty to affluence, we believe that you will both see and feel that energy, that vim, that fire of human intelligence which San Francisco has shown in the last six years. No wonder we are proud of our dear city of the day. No wonder we are loyal to the name of California and of San Francisco, and no wonder that with pride, gentlemen, this morning, I stand before you as the representative of the Panama Exposition Company asking you in 1915 to come within our gates, whither will be assembled congresses of technical societies from all over the world. Congress has lent itself to this celebration and has helped in every way within its power and we are to have there, as I tell you, an Electro-Technical Congress and meetings of all of the great technical societies, the American Society of Mechanical Engineers, of Civil Engineers, of Mining Engineers, of Hydraulic Engineers, and, we hope, the crown of all of the societies, the one largest in importance, largest in scope, controlling the greatest amount of capital—the National Electric Light Association. The matter will not be submitted to you this morning for decision, but as you think it over, as you think of our marvelous State, little of which you have seen, as you go home and when you are trying to keep warm this winter, you think of our sunny vales and sunlit skies, you will want to come back to our dear old San Francisco and California. Whether you go to the orange groves of Los Angeles, or to the Siskiyou Valley to see the marvelous mountains, or to the summit of the Sierra Nevadas, you will eventually gravitate to the beautiful city of San Francisco, where peace and plenty abound and where we will do all that man can do for you in 1915.

Come, I pray you. [Applause.]

THE PRESIDENT: From the responsive chord which Mr. Britton's invitation has struck, I think, while it is impossible for me to give an official reply, we can assure him it will be given all the consideration which its cordiality merits. We hope that he will convey that message, with our thanks, to San Francisco.

The next order of business will be the report of the Committee on Organization of the Industry, Mr. H. H. Scott, of New York City, Chairman.

REPORT OF THE MEMBERSHIP COMMITTEE

Your Committee on the Organization of the Industry reports the membership as of this date to be:

June 11, 1912 A, 1134; B, 9725; C, 45; D, 240; E, 940; Total, 12,084.

The net gain by classes since the reading of the last report is as follows:

Class A	176
" B	3071
" C	26
" D	14
" E	132
Total	3419

A comparison shows that the net gain for the past year is more than the total membership of three years ago and is 376 more than the increase of 1911 over 1910.

There have been added three new Geographical Sections, viz.: the Northwestern, Iowa and Michigan Sections, and we now have a total of ten Geographical Sections. The tables appended to this report show the comparative growth of these various Sections and your Committee desires to call especial attention to the excellent increases made by Pennsylvania, Eastern New York and Canada.

Our Class A membership shows a net gain of 176 members as compared with an increase of 108 last year. This is an excellent increase and is, with possibly one exception, the largest increase in numbers that has yet been made in any one year.

At the suggestion of President Gilchrist a dignified pledge was sent to various members asking them if they would be one of a Committee of 100 who would use their best endeavors to obtain one Class A member. We readily obtained the 100 signatures and to date we have approximately 35 additional Class A members as a direct result of these pledges.

The affiliation of the three Geographical Sections added about 100 Class A members, Iowa alone contributing 69, and all three Sections continue to be very active in increasing the membership. During the past year nine new Company Sections have been formed, adding approximately 600 Class B members:

NEW COMPANY SECTIONS

Columbus Railroad Co., Columbus, Ga.
Cosmopolitan Electric Co., Chicago, Ill.
Kansas City Electric Co., Kansas City, Mo.
Union Gas and Electric Co.. Cincinnati. Ohio.
Consolidated Power and Light Co., Deadwood, S. D.
St. Paul Gas Light Co., St. Paul, Minn.
Portland Company Section, Portland, Ore.
Montgomery Light and Water Power Co., Montgomery, Ala.
Indiana and Michigan Traction Co., Ft. Wayne, Ind.

The total membership in the 37 Company Sections is now approximately 7700, while the total Class B membership is 9725. This is an increase of approximately 2300 Class B members in Company Sections and shows a growth of about 1700 members in the Sections formed prior to our last report.

Practically all of the Company Sections show an increase over last year, but your Committee desires to call especial attention to the growth of the following Sections:

The Allegheny County Light Co., Pittsburgh, Pa.
The Consolidated Gas and Electric Light Co., Baltimore, Md.
The Brooklyn Edison Electric Illuminating Co., Brooklyn, N. Y.
The Denver Gas and Electric Co., Denver, Colo.
The Commonwealth Edison Co., Chicago, Ill.
The West Penn. Electric Co., Connellsville, Pa.
The Peninsular Electric Light Co., Detroit, Mich.
The Public Service Electric Co., Newark, N. J.
The New York Associated Companies, New York City, N. Y.
The Philadelphia Electric Co., Philadelphia, Pa.
The Toronto Electric Light Co., Toronto, Ont.
The Hamilton Electric Light and Power Co., Hamilton, Ont.
The Empire District Electric Co., Joplin, Mo.

The tables showing the various increases by Sections are appended, but I will not attempt to read them. The Commercial Section continues to have a remarkable increase in growth, but it is not possible to report the total at this time because the applications made within the last few days have not been turned over to the Secretary. The Power Transmission Section does not show a very marked change, but we now have an active sub-committee for this Section and we look for improvement. In justice to this sub-committee, it is but right to say that it was only recently organized.

Your Committee has followed the general lines of last year's campaign except that we have materially increased the number on our committee and have depended more upon personal contact than upon circular letters.

Last year President Freeman predicted that the Association would in the near future have 25,000 members, and this continued rapid growth carries us well on toward the realization of that forecast.

Respectfully submitted,

Committee

H. H. Scott, *Chairman*
Ben C. Adams
Harold Almert
H. C. Blackwell
N. H. Boynton
M. R. Bump
C. E. Brenton
Douglass Burnett
F. P. Cummings
J. E. Davidson
E. C. Deal
C. N. Duffy
H. G. Glass
P. G. Gossler
H. J. Gille
H. E. Grant
Mike S. Hart
E. H. Haughton
D. A. Hegarty
R. W. Hemphill, Jr.
C. H. Hodskinson
George C. Holberton
C. W. Hubley
A. H. Jones
Peter Junkersfeld
S. M. Kennedy
T. E. Kenney
E. Kifer
E. E. Larrabee
W. A. Layman
F. J. Lege
D. H. McDougall
J. C. McQuiston
H. I. Markham
E. S. Marlow
L. D. Mathes
B. W. Mendenhall
T. W. Peters
Van D. Rickert
C. E. White
H. M. Winter

Class A Companies merged or consolidated with other companies, 21.

CLASS B's RESIGNED FROM LARGE COMPANIES FROM JULY, 1911, to MAY, 1912

Denver Gas and Electric Co., Denver, Colo.	44
Commonwealth Edison Co., Chicago, Ill.	265
Consolidated Gas, Electric Light and Power Co., Baltimore, Md.	41
Boston Edison Electric Illuminating Co., Boston, Mass.	8
Peninsular Electric Light Co., Detroit, Mich.	10
Empire District Electric Co., Joplin, Mo.	65
Kansas City Electric Light Co., Kansas City, Mo.	9
Union Electric Light and Power Co., St. Louis, Mo.	124
Edison Electric Illuminating Co., Brooklyn, N. Y.	134
Flatbush Gas Company, Brooklyn, N. Y.	5
New York and Queens Electric Light and Power Co., Long Island City, N. Y.	39
New York Edison Co., New York City	133
United Electric Light and Power Co., New York City	16
Westchester Lighting Co., Mt. Vernon, N. Y.	6
Rochester Railway and Light Co., Rochester, N. Y.	5
Philadelphia Electric Co., Philadelphia, Penn	44
Allegheny County Light Co., Pittsburgh, Penn.	83
Milwaukee Electric Railway and Light Co., Milwaukee, Wis.	67
Toronto Electric Light Co., Toronto, Ont.	89
Montreal Light, Heat and Power Co., Montreal, Que.	9
	1193

LIST OF COMPANY SECTIONS

	1911	1912
Birmingham Railway, Light and Power Co., Birmingham, Ala.	7	6
Montgomery Light and Water Power Co., Montgomery, Ala.	....	55
Denver Gas and Electric Co., Denver, Colo.	163	318
Potomac Electric Power Co., Washington, D. C.	17	13
Columbus Railroad Co., Columbus, Ga.	....	6
Savannah Electric Co., Savannah, Ga.	20	9
Commonwealth Edison Co., Chicago, Ill.	1133	1554
Cosmopolitan Electric Co., Chicago, Ill.	....	154
Public Service Co. of Northern Illinois, Chicago, Ill.	....	400
Des Moines Electric Light Co., Des Moines, Iowa	8	5
Consolidated Gas, Electric Light and Power Co., Baltimore, Md.	92	297
Edison Electric Illuminating Co., Boston Mass.	172	171
Peninsular Electric Light Co., Detroit, Mich.	48	104
St. Paul Gas Light Co., St. Paul, Minn.	....	25
Empire District Electric Co., Joplin, Mo.	110	143
Kansas City Electric Light Co., Kansas City, Mo.	....	125
Union Electric Light and Power Co., St. Louis, Mo.	274	182
Public Service Electric Co., Newark, N. J.	122	202
Edison Electric Illuminating Co., Brooklyn, N. Y.	608	687
Buffalo General Electric Co., Buffalo, N. Y.	38	38
New York Companies Section, New York City	1342	1490
Rochester Railway and Light Co., Rochester, N. Y.	130	130
Union Gas and Electric Co., Cincinnati, Ohio	....	23
Portland Companies Section, Portland. Ore.	....	136
Penn. Central Light and Power Co., Altoona, Penn.	18	15
West Penn. Electric Co., Connellsville, Penn.	7	34
Philadelphia Electric Co., Philadelphia, Penn.	528	577
Allegheny County Light Co., Pittsburgh, Penn.	219	315
Metropolitan Electric Co., Reading, Penn.	....	11
Scranton Electric Co., Scranton, Penn.	41	22
Consolidated Power and Light Co., Deadwood, S. D.	....	19
San Antonio Gas and Electric Co., San Antonio, Tex.	45	30
Utah Light and Railway Co., Salt Lake City, Utah	15	13
Milwaukee Electric Railway and Light Co., Milwaukee, Wis.	88	73
British Columbia Electric Railway Co., Vancouver, B. C.	25	41
Hamilton Electric Light and Power Co., Hamilton, Ont.	....	44
Toronto Electric Light Co., Toronto, Ont.	150	184

MEMBERSHIP OF THE GEOGRAPHIC SECTIONS

	Class A	Class B	Class C	Class D
Eastern New York Section	37	139	6	110
Georgia Section	17	29	1	22
Michigan Section	48	128	5	5
Mississippi Section	15	23	0	1
Nebraska Section	28	23	0	3

NEW ENGLAND SECTION

	Class A	Class B	Class C	Class D
Maine	14	7	0	2
New Hampshire	19	10	0	0
Vermont	16	21	0	2
Massachusetts	48	347	30	129
Rhode Island	6	49	6	7
Connecticut	20	41	9	8
	123	475	45	148
Pennsylvania Section	75	1025	20	102
Canadian Section	53	481	9	58

THE PRESIDENT: If there are no remarks on Mr. Scott's report, we shall proceed to the report of the Secretary.

MR. MARTIN then read his report as follows:

REPORT OF THE SECRETARY

It is with much pleasure that the Secretary of the Association makes a report of sustained activity and unsurpassed growth in every department of Association work. Correspondence is always an indication in such respects, and it may suffice to note that the number of letters received in the Secretary's office from June to June reached a total of 24,814, while the number of letters sent out was 22,474. This would give a daily average for working days of the year of 80 in and 74 out. To this may be added the fact that the postage bill of the Association for the year amounted to $4,213.05. Owing to the increase in the membership of the Association the editions of the *Bulletin* have increased from month to month so that 100,000 copies have been mailed. In addition to this the office has issued about 20,000 copies of circulars and nearly 12,000 bills. If for no other reason than the amount of work indicated by such statistics, it has been found necessary to give the Secretary an assistant who can assume responsibility in the frequent absences from the office now demanded of the Secretary by the increasing number of Geographic and Company Sections. An additional reason for this increase in force is found in the fact that at the end of the present administration it is proposed to place in the office of the Secretary, and under his administration, the *Question Box* which for some years past has been carried on in the office and at the entire expense of one or other of the larger member companies. The *Question Box* assumes each year more importance as a swift means for the intercommunication and interchange of ideas and experiences, and it is obvious that the work connected therewith will tend still further to develop the amount of correspondence which has to be handled in the Secretary's office. In addition to all these items, it may be added that free use is made of postal cards for various purposes and that several thousand were issued in advance of the convention with particular reference to Seattle.

During the past year, on the initiative of the President, a cover was added to the *Bulletin*, giving it more the character of a magazine, and it is proposed during the coming year to adopt a standard magazine size for the page as well as to make such modifications in the typography as will increase the amount of reading matter without an undue increase in the expense of publication. In fact, the idea is to throw more weight and emphasis on the *Bulletin* as a means for the dissemination of information and knowledge with regard to the Association and its work, and to lessen as far as possible the heavy expense now incurred in the issuance of the annual *Proceedings* in their present shape. It is not, perhaps, realized that out of an income of about $100,000 nearly one-half is spent on the publications of the Association, and in spite of the most rigid economy this amount is likely to grow unless steps are taken to reduce the annual expense of the *Proceedings.* During the past year this item alone amounted to nearly $20,000, to which must be added about $7,000 for advance copies of papers and reports handed out at the New York Convention. Such an expense is disproportionate and the plan now approved by the Executive Committee is to sub-divide the *Proceedings* so that each member will receive, in a separate volume, those papers and reports in which he is most directly interested, *i. e.,* Technical, Commercial, Accounting, Power Transmission, etc. In this way the printing bill can probably be cut down 25 per cent, leaving more money available for the development of the *Bulletin.* At best, the *Proceedings* cannot be issued until five or six months after the convention, whereas any event or fact of importance can be placed before the membership in the *Bulletin* within a month.

As thus indicated, the amount of publishing that the Association has already undertaken is considerable, and the question confronts us as to how far we shall go in this direction. During the past year we have issued 12,500 two-volume sets of *Proceedings,* each of which consisted of over 2,000 pages of printed matter; 2500 copies of the Revision of the *Question Box* (a bound volume of 311 pages) and 4000 copies of the Electrical Solicitor's Handbook; while for the present convention an edition of 2500 copies of the new Electrical Meterman's Handbook, a volume of nearly 1000 pages, has been prepared. In addition to this, the Commercial Section has brought out 2000 copies of the Commercial Digest in loose-leaf form and three handsome pamphlets devoted to specific branches of work, namely: Industrial Lighting, 20,000, Residence Lighting, 5000, and Street

Lighting, 10,000 copies. Many of these publications are due to the labor of standing and special committees, and could not be issued without their self-sacrificing efforts, but it is plain that there must be a limit to such work, and that in the long run the tendency will be either to throw this work on the office of the Secretary or to make contract arrangements with regular publishers of technical literature.

The demand for all these publications of the Association is large and active throughout the year. Successive editions of the Handbook are called for. The 2500 copies of the Revision of the *Question Box* issued only six months ago are almost exhausted and the large edition of the Standard Classification of Accounts has been entirely used up, necessitating a further edition of 500 copies at this moment, although the Accounting Committee contemplates a revision of the book at an early date. During the year also, as is well known, the Commission of the Association on the subject of Resuscitation from Shock has reached such finality in its work as to enable it to issue through the Association a chart and a booklet, 1500 copies of these having been printed for this convention. It seems quite likely that the editions of this chart and booklet may easily run into scores of thousands of copies.

Although the Association has, since 1906, suspended the publication of its pamphlets giving the rates for city and commercial lighting, etc., of its member companies, it has continued the practise of accumulating these data, and during the present year has secured the returns of over 700 member companies and systems. While this information is not put into print, the Secretary's office is in constant receipt of requests for it, often by telegraph, and has supplied a great many member companies on request with full tables of rates in cities of a certain size or in certain localities or for different classes of business. A good deal of this work has been further developed by the Rate Research Committee, which for some months past has issued a mimeograph bulletin on rates of several sheets weekly to the member companies most interested.

During the past year there have been affiliated with the Association, the Northwest Electric Light and Power Association, within whose borders we meet; the Michigan Electric Association and the Iowa Association. Company Sections have also been formed in Kansas City, Milwaukee, Cincinnati, Montgomery, Portland, Oregon, and St. Paul. It is interesting to note that the Company Sections in both Kansas City and Portland have assumed a composite character by taking into their membership persons in the vicinity not connected directly with the local company, and also in reaching out so as to include central-station employees in cities adjacent. The Cosmopolitan Electric Company, in Chicago, has also organized a separate Company Section during the year, thus reinforcing most notably the very large membership already enjoyed in that region by the Commonwealth Edison Section and the Public Service Company of Northern Illinois. It might be added that during the year movements have been afoot in other cities and in other States for Section organization, so that in both directions the Association advances steadily toward its destiny in the federation of all the State associations and the extension of the individual membership to every officer and employee earnestly and actively interested in the industry as affording him a life career.

Cordial and intimate relations have been maintained throughout the year between the Secretary's office and the offices of all the Sections, Geographic, National and Company. This has involved, naturally, a large amount of correspondence, as well as a great deal of telegraphing and long-distance telephoning, especially as to the attendance of the President, or the Secretary or some representative of the Association at meetings. Both officers have been kept very busy in responding to invitations from the Sections by personal attendance, and for himself the Secretary can report visits to Canada, Detroit, Pittsburgh, Scranton, Philadelphia, Newark, N. J.; Chicago, Springfield, Mass.; Seattle, Vancouver, Portland, Oregon; Spokane, St. Paul, Minneapolis and Milwaukee. On behalf of the Association the Secretary also visited Washington, and presented to the Secretary of Agriculture resolutions urging his department to study and report upon the increasing relations of electricity to rural districts and the farm.

It may be noted in connection with the Seattle convention that unusual efforts and outlay have been required to cope with the problems arising in connection with a convention so far from headquarters. As a result, some fifty papers and reports were printed in New York and were delivered in Seattle two weeks before the convention began, representing 1400 pages of printed matter and 75,000 separate copies. In addition to this, complete sets of these papers and reports were placed on the special trains headed for Seattle, so that members could acquaint themselves with the work of the convention in advance and be better able to participate in the discussions. The bulk of this work, including the making of nearly 400 illustrations, was done within a month, and all this is exclusive of the special publications referred to in other paragraphs.

The increase of work at headquarters has not only necessitated an increase in the staff, but has also required more space for its performance, so that the Association has had to annex two more rooms, giving it a very large proportion of the floor in the Engineering Building where the headquarters are located. In addition to this, the Secretary of the Commercial Section has also established offices in New York in the same building, occupying two rooms on the floor below, while other space has been taken on for storage purposes. It will readily be seen that if the Association continues to grow at its present pace, to do which it is only necessary for it to expand at the same rate as the industry, we shall soon be confronted with a very serious problem as to office accommodations.

In conclusion, the Secretary desires to place on record his keen appreciation of the loyalty of the office force under his direction, without whose help it would have been quite impossible for him to place before the Association the present record of work accomplished.

THE PRESIDENT: Is there any discussion on the Secretary's report? If not, we have a resolution to be offered by Mr. Freeman.

MR. W. W. FREEMAN, Brooklyn, New York: I should like to submit a resolution for consideration at this time. The President in his report has referred to the activity of Past-Presidents in the affairs of this Association, and in fact their attendance has been a marked feature of every convention, this convention being no exception to the rule. That fact makes more noticeable the absence of one of our Past-Presidents, Mr. Louis Ferguson, of Chicago, who has always been at the conventions and who, but for a serious illness, would be here this year. I am sure we shall greatly miss his genial presence and forceful participation in the debates of this convention. It is fitting, and I take pleasure in submitting a resolution that the Secretary be instructed to communicate to him our greetings, our deep regret at his absence, and the pleasure with which we have received news of his convalescence.

The motion was seconded and carried.

THE PRESIDENT: The next number is the report of the Insurance Expert, Mr. W. H. Blood, Jr., of Boston, Mass.

REPORT OF THE INSURANCE EXPERT

It is gratifying to note that during the past two years the Fire Underwriters have been giving more attention to the scientific rating of electric power stations than previously. The electric light operators have also come to realize more forcibly than before that by building upon specifications made by the Underwriters, and by adopting more careful housekeeping methods, they not only secure lower premium rates, but also make their plants less liable to be put out of commission by fires. It is to be hoped that the Underwriters will continue their work of rate revision, and it is believed that if they are persistently and judiciously encouraged by the electric lighting companies, they will be more expeditious in achieving the results which we are looking for.

Improvements in risks are constantly going on, consolidations of properties are wiping out the old and dilapidated installations, and as new plants are built they are being constructed along lines which will secure the lowest fire insurance rates. Managers of properties are also giving closer attention to the smaller details of keeping their plants clean, of eliminating oil and waste, and of making wiring safe, all of which are as important as the original construction of the buildings.

That there is still some work for the Underwriters to do in scientific rating is clearly brought out in the report of D. L. Gaskill, Secretary of the Ohio Electric Light Association, based on statistics gathered from Ohio Central Stations. This report says: "Rates are entirely unequal, ranging from .8 of 1 per cent to 4 per cent per annum and seem to bear no relation to the kind of risk or its fire hazard. In one instance a frame building, with a paper roof, had the rate of 1 per cent, while in another, a brick station with metal roof had a rate of 3 per cent. In one large city station, with every fire protection known, the rate is 4 per cent per annum, and this station reports that it never had a fire."

Liability insurance is at the present time in a chaotic condition. In many States, workmen's compensation laws are being considered or have already been enacted. What the effect of these will be when they come to be enforced is entirely a matter of conjecture. In States where there is no agitation it is anticipated that jurors will be somewhat influenced by settlements obtained in nearby States under the newly enacted laws.

The State of Washington has recently passed a compensation law which is based on the theory that industry should bear the greater portion of the burden of the cost of its accidents. Each employer is required to pay into the State treasury a certain percentage of his total pay-roll for the year. Different occupations are classed together and the theory is to make each class self-sustaining. Electric light and power plants are classed with interurban railroads and quarries, and have a rate of 4 per cent. In some ways the scheme appears to have merit, but one fundamental objection to it is that it tends to destroy care of operation in individual plants. The entire class, which has been arbitrarily selected, bears the burden, and any individual property may be operated with care or with negligence, as it sees fit, and it will receive no credit nor pay any penalty for so doing.

This mixed-up condition of affairs above referred to has, in many instances, caused the liability companies to double their rates, and, although this makes a large burden for the electric lighting companies, we are not in a position to say that the insurance companies are entirely unjustified in taking this course.

To secure liability insurance at cost, a scheme of inter-insurance has been worked out and put into effect at St. Louis. The idea is not new, and while it has worked well in some groups of manufacturers, and particularly so as applied to fire insurance, notably the cotton, woolen and other mill mutuals of New England, it has more often been a failure. This Utilities Indemnity Exchange, as it is called, is, I believe, the first attempt to organize public utilities along these particular lines. The outcome of this experiment will be watched with interest.

The National Electric Light Association has followed closely the efforts of Mr. Henry N. Staats, Insurance Expert of the American Railway Association, to form a mutual electric railway insurance organization, and while thus far he has not realized his ideal, he has achieved success along other lines, for he has secured remarkable reductions in rates for street railway properties from the stock companies, and has been successful in convincing the senior mutual insurance companies that a sprinkled car barn is a good risk.

Due to the fact that it is believed the practise of electric wiring is becoming fairly well standardized and that as a consequence there is less need of frequent revision of rules, the Electrical Committee of the National Fire Protection Association has decided to hold biennial public meetings instead of annual ones. An interim meeting of the committee itself, however, was held in Boston on March 22 of this year, and many points of interest were discussed, and in most cases referred to committees with instructions that they report at the next public meeting, which comes in March, 1913.

As stated in the report of the Committee on Grounding Secondaries, your Insurance Expert presented certain resolutions to the Electrical Committee of the National Fire Protection Association, and this committee voted to approve the recommendations and to present them to the Electrical Committee at the open meeting to be held in 1913, for the purpose of having them adopted and printed in the 1913 Code.

In substance, these rules, when they are passed, will make it mandatory to ground secondary alternating-current circuits up to 150 volts and permissive above that voltage. Special emphasis is also laid on the value of making good ground connections through metallic water-piping systems, in preference to any other kind of ground, in the "assurance that the integrity of such piping systems will in no way be affected."

The new rubber-covered wire specifications are just coming into effect and it is too early as yet to say how they will work out, but while it is realized that they are imperfect in many ways, it is admitted that they are a great improvement over the old specifications.

No serious attempts have been made this year to make any radical change in the rules, but, judging from past experiences, we may look in 1913 for the regular number of suggestions which will tend to increase the cost of wiring. The New York City Wire Department has adopted a rule to prohibit the use of wooden mouldings after June 1, 1913. A similar rule is already in effect in several other large municipalities. While this is probably a justifiable regulation for the larger municipalities, it would be a hardship if applied to most of the smaller cities and towns.

Recently a bill was introduced in the Virginia Legislature which contemplated placing the responsibility for the condition and suitability of all the electrical apparatus, fixtures, wiring, etc., in the customers' premises upon the company supplying the service. Fortunately the bill was not passed, but it may come up again at the next session of the Legislature. If it should pass it would make the operating company the insurer of the wiring in every house connected to its mains.

Even if an electric light company operating under such a law should make frequent inspections of all inside wiring at a large cost, it could not be sure that at any moment safe conditions might not be changed into dangerous ones by irresponsible wiremen, economical owners or boy amateurs. It is not conceivable that enlightened legislators would pass such a bill if they really knew what it meant. There is, however, a noticeable tendency of the courts to hold companies for contributory negligence, though in some cases, upon slender evidence.

In a recent number of *The Electrical Review and Western Electrician,* the editors of the legal notes made the statement: "Where the owner of a house or someone of his family or someone acting for him is injured because of defective wiring or defective equipment in the house, the company is liable. This is the rule even though the company is not responsible for the interior installation. If a third person or company has installed the interior equipment and the company has connected up its service, the company is responsible for accidents occurring from the defective installation." While this is an extremely strong statement, and certainly is subject to explanation and exceptions, still it brings out forcibly the necessity for greater care on the part of operating companies in keeping their own outside lines in first-class condition and of exercising a much more close supervision over and inspection of the inside wiring installations to which they are furnishing service.

For the first time since the creation of the office, your Insurance Expert has this year been called to go out of the country. At the request of the Montreal Light, Heat and Power Company, he went to Quebec to assist the company's attorneys in defeating a bill which contemplated requiring the company to place its wires underground in certain residential sections. The objectionable feature of the bill was that the company was required to go to a large expense in building underground conduits, wires, etc., although the territory was but sparsely populated, and it was not allowed to recoup itself for its extra and unnecessary investment by any change in its rates. If such a precedent had been established, its ultimate conclusion might easily have placed Canadian companies in the hands of receivers, simply to satisfy the esthetic demands of the citizens of any community. Fortunately this bill was killed.

Sporadic outbreaks of gasoline lighting competition are constantly reported, but they are not of serious proportions. The managers of electric lighting companies seem in most cases to seek sympathy rather than advice. Gasoline competition is often looked upon as a mixed blessing, for, while the electric company generally loses a few customers, the use of gasoline educates the consumer to more light and he soon comes to realize that his ill-smelling, hot and dangerous gasoline lights are not in the same class with the odorless, cool and safe electric lights of his competitor. The continued use of gasoline for lighting is generally found where the electric company's service is poor or its rates high, or perhaps both, and in such cases the electric company deserves no sympathy.

An unusual situation was reported last year, where an electric lighting company in Hobart, Oklahoma, was being sued for the alleged burning of a large business block. The electric light company has, during the year, been foreclosed, and while this would probably make a judgment against the company worthless, it is interesting to note that the case of the lighting company was so well prepared and the evidence was in such shape that it is doubtful if the insurance companies could have secured a verdict in their favor.

Many cases are called to the attention of the Insurance Expert during each year, but often a case is so far along that the value of his assistance is lessened. If requests for assistance were made earlier in the proceedings, the experience and help of the Insurance Expert could be more profitably utilized.

Respectfully submitted,

W. H. BLOOD, JR.

THE PRESIDENT: Is there any discussion of Mr. Blood's report? If not, we shall proceed with the report of the Committee on Progress, Mr. T. C. Martin, New York City, Chairman.

MR. MARTIN: The report of the Committee on Progress is already in your hands and as it is a document of one hundred and twenty pages, I shall not make an attempt to read it. I would like to state that at the suggestion of Past-President Doherty, the preparation of such a report was undertaken seven years ago. I had the honor of being made the committee on the subject without any associate. For seven years past, I have had the privilege of presenting such a report, and I can only say that I return to the task each year with renewed pleasure in the opportunity of being, in this respect, the historian of the Association and of the art. The report has changed its nature and scope somewhat, from year to year, and as the number of committees has increased it has necessarily devolved upon them to relieve this committee.

You will note, however, that the report each year gains somewhat in bulk, and is an evidence of the expansion of our field of industry. The report is this year for the first time in two sections, Part One being devoted to general progress; Part Two, on power transmission progress, being prepared for this convention in that shape at the special request of Mr. Doherty, who is Chairman of that Section. The contents of this report are summarized on the first page of the book.

This report is altogether inadequate as a representation of what I would have done had I had a little more time. [Applause.]

REPORT OF THE COMMITTEE ON PROGRESS*

PART I

GENERAL GROWTH

Born in Chicago, hugging the shores of the Atlantic tightly for twenty-five years, venturing timidly as far west as St. Louis, Kansas City and Denver, this year the National Electric Light Association has at last found its way to the Pacific Coast, and thus begins a new chapter in its history. Having embarked gaily on this adventure, it will assuredly come back to regions like its own, possessed of such illimitable promise and progress, even if in the meantime it cultivates and frequents those older portions of the country where density of population and production insure a more immediate and safer return on plant and investment. National conditions are, indeed, closely analogous to those of the industry, and it is easily discernible to a student of statistics that the pivot of our industry coincides significantly with the centre of population as it shifts slowly westward. But while the intensive cultivation of the field impinges necessarily with most force on the solidified areas of the great cities and on the big manufacturing States, it is to the Far West that we look for the huge development of power-transmission work, embracing vast territories and fructifying mineral and agricultural resources heretofore unresponsive to the breath of life and hope. In the Far West is our far-flung battle-line, and there will our industry reap the greatest victories of courage and enterprise.

This section of the country in which we meet owes more than any other to the energy and ambition of individual men and of capital concentrated in public utilities; in but few other sections has been manifested more vividly the spirit of antagonism that would deny to personal initiative, efficiency, economy and leadership the rewards that embody in a very trifling degree the total gains to society. Our art could not exist or gain ground, however, if it did not bring with it greater conveniences and comforts at lower cost than had ever been enjoyed before; and we rest confident in the belief that sooner or later this fundamental fact must be realized by the whole body politic, and that a more generous encouragement will be given to every attempt on the part of central-station systems to extend their networks and perfect their service. We all realize, if no one else does, that public good-will is our largest asset.

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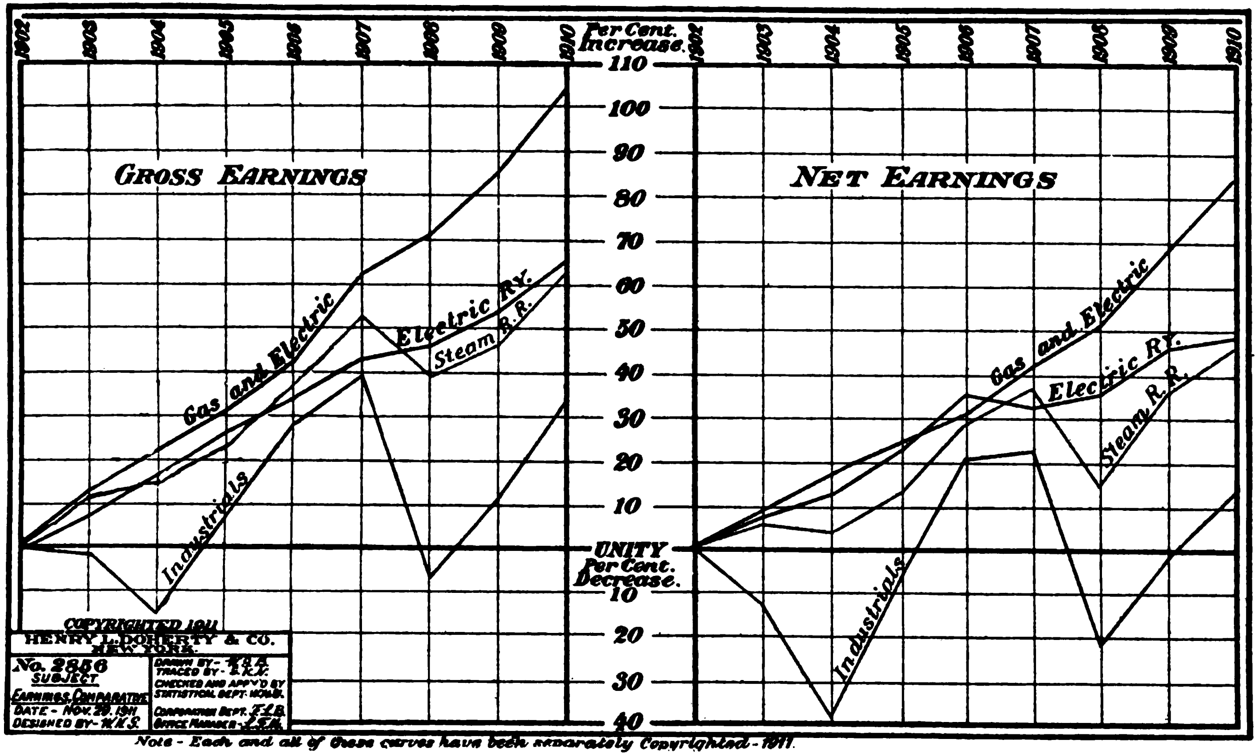
*Part II of this Report, for the Power Transmission Section, is printed separately.

During the past year there has happily been manifested an increasing tendency on the part of capital to assist in the development of our enterprises in the central-station field, where the public good-will has been cultivated or can be won by good service, and the result is seen in an activity of development never equalled since the earliest days of the art. The financial status then predicated on promises is now based on results, and must yield benefits to the entire nation, for it means the carrying into rural districts of circuits and apparatus hitherto enjoyed chiefly by urban centres. The encouraging statistics of electrical industry have recently been brought out in two striking documents. One is from Stone and Webster and deals with six electric railway systems, three of which do also an electric lighting business, and gives comparisons from December 31, 1906, to December 31, 1910. The properties are distributed all over the country. The figures show 69.93 per cent increase in gross earnings; 166.45 per cent in dividends, and 140.58 per cent in reserves and surplus. There has been an average of 11.92 per cent increase in the value of the outstanding securities. Such items are significant. Equally so are the curves worked out by Henry L. Doherty and Company last December showing the relative increases and decreases of the gross and of the net earnings of steam railroads, of electric railways, of gas and electric companies, and of "industrials," for each of the nine years from 1902 to 1910. They obtained the gross and net earnings of all the steam railroads of the United States, and of all "industrials" listed on the New York Stock Exchange which could be traced back to 1902; and whose aggregate gross for that year amounted to about $1,250,000,000. The firm obtained the gross and net earnings of the electric railways in most of the larger cities of the country, and similar gas and electric light figures, using all amounts available without selection, but exclusive of New York City. All of these great barometer sets of figures were standardized at unity for 1902, and the percentage calculated of their subsequent increases and decreases based on 1902. The resulting curves prove that the gross and net earnings from the electric and gas businesses increased the most rapidly, and



Note - Each and all of these curves have been separately Copyrighted - 1911.

RELATIVE GROSS AND NET EARNINGS OF STEAM RAILROADS, INDUSTRIALS, AND GAS AND ELECTRIC UTILITIES that they are practically unaffected in their rate of increase even by such panic conditions as those of 1907 and 1908. The bearing of such data on questions of investment is too obvious to need any emphasis.

Other Aspects of Growth

The advances in the industry can be envisaged from other points of view not less interesting. For example, our veteran fellow member, President A. C. Dunham, of the Hartford (Conn.) Electric Light Company, has just retired from the executive chair after thirty years of conspicuous leadership, and closing a period of unparalleled activity in fostering all the successive improvements in plant and in enhancing the efficiency of service to the consumer while lowering the price. His work has received due recognition at the hands of the technical press, and was well summed up last November by Prof. C. F. Scott at the New Mason Laboratory of Mechanical Engineering, Yale University. President Dunham began his central-station managerial career when the Hartford plant in 1882-3 had a connected load of 45 commercial arc lamps fed from a second-hand United States dynamo driven by a 50-hp Armington and Sims engine, in a wooden lean-to shed, operated by steam bought from a local heating company. Those are fairly humble beginnings for a big system. The data given by Professor Scott show that since 1901 the company's earnings from residence lighting have increased 500 per cent; from commercial power sales, 410 per cent, and from commercial lighting, 210 per cent. In 1902 the total annual output was 11,000,000 kw-hours, and in 1910 35,000,000 kw-hours. The maximum meter rate has dropped from 17 cents in 1894 to 10 cents at present. In 1901 the proportions of the total earnings were as follows: Street lighting, 17 per cent; residence lighting, 7 per cent; power, 22 per cent; commercial lighting, 54 per cent. In 1910 these proportions were 6.5, 13.5, 36 and 44 per cent, respectively. The average earnings of the company were 4 cents per kw-hour in 1901, compared with 2.6 cents at present. Meter rates for power now run from 6 cents to 1.33 cents, the lowest rates being given to installations of about 300-hp capacity or over, operating at about this load for at least ten hours daily. In 1895 the company had twenty-four generators rated at 1050 kw total, compared with ten rated at 16,500 kw to-day. Professor Scott stated that practically every isolated plant in Hartford has yielded to the superior economy of central-station service. About 6000 homes are supplied with light by the company, half of these being served at 60 volts on a flat rate. It might be added that, among other pioneer innovations, the plant at Hartford was the first to put in a modern steam turbo-alternator; that there the first Nernst glower lamps made their commercial appearance; the first storage battery in central-station work; the first tungsten street lamps; the first central-station polyphase transmission apparatus, and the first modern methods for flat-rate residence lighting. President Dunham's ideas and work have been frequently referred to in the Reports on Progress.

An excellent summary of existing conditions in the technical end of the industry, on which the sound financial situation rests, was given before the Association of Edison Illuminating Companies last September by President Thomas E. Murray, and is in place here in discussing the general growth. The treatment was devoted entirely to large stations, representing the very highest type, from the standpoint of reliability of service, operating economy and structural excellence. Larger boilers are coming into vogue, and the evolution of boiler furnaces is such that fuels heretofore considered worthless can now be burned to advantage. Stokers are less automatic but more efficient than formerly, and the growing scarcity of steam sizes of anthracite, rendering a greater use of bituminous coal necessary, carries with it a wider adoption of the mechanical stoker. The steam-piping systems now in use are designed on the unit system, with interconnecting mains and steam speeds of 12,000 feet a minute. Steam pressures still remain between 175 and 200 pounds, and the use of superheated steam is becoming more general. A great improvement in boiler feeding has followed the use of the centrifugal pump and accurate water meters, and open heaters and forced draft are most widely employed in later stations. The steam turbine has supplanted the reciprocating engine in large stations, and Mr. Murray doubts if any more large reciprocating units will be installed for power-station purposes. Coming to the electrical equipment, Mr. Murray held that the design is largely influenced by the character of the load and the distance to which energy is to be transmitted. In bus-bar arrangements standard practise favors the group method of generator and feeder connections having two sets of bus-bars sectionalized at one or more points by switches. For bus and switch compartment work concrete is coming largely into use, but brick makes a more finished construction, while for high-tension switches and for flooring high-tension compartments soapstone is still the best available material. The improvements made in protective devices and instruments for switchboards are noted by the author, as well as methods of control which have worked well in practise, especially in stations having system operators or load dispatchers. Under the caption of operating costs Mr. Murray stated that at the present time attention to station economics with large units and careful design has resulted in a station cost which is gradually approaching a minimum. He divides the cost of a fair-size station per kilowatt as follows:

	Per Cent
Building structure	30
Boilers, furnaces and boiler-room auxiliaries	20
Turbines, generators and condensers with auxiliaries	25
Piping systems	10
Switchboard and other electrical work	7
Miscellaneous small items not otherwise included	8
Total	100

The importance of striving after a low cost of construction per kilowatt of station capacity will be appreciated when it is considered that the effect of a saving in the station investment cost of $5 per kilowatt is equivalent to an annual saving in the coal bill of 12 cents with coal at $3 a ton, where a fixed annual charge on the investment of 14 per cent is allowed to cover interest, depreciation and taxes. It would appear, according to Mr. Murray, who speaks from a vast experience, that further improvements must come from advances in the direction of reduction in cost, increase of output and an improvement in the load-factor under which the stations operate, rather than in the efficiency of the individual units.

Present Statistics

It is the custom to give in this Report data showing the general figures of central-station development, and usually it has been possible to bring the statistics down to April 1. This year the Report is filed a month earlier than usual, and the latest available figures, therefore, are those of the *McGraw Electrical Directory* for October, 1911. It is evident, therefore, that these figures are subject to an increase for the six months in order to render them comparable with the figures for a full year given in the Report of 1911, which would imply a further increase of not less than 100 central stations, making a total of 6406 as of April, 1912:

SUMMARY OF CENTRAL STATIONS, BY STATES, OCTOBER, 1911

State	Number of Companies	Number of New in This Issue	Number Carrying Electrical Supplies	Number of Municipal Plants
Alabama	67	1	39	30
Alaska	11	2	9	0
Arizona	24	1	15	0
Arkansas	76	1	41	14
California	171	4	89	16
Colorado	87	1	61	9
Connecticut	55	0	30	5
Delaware	16	0	6	6
District of Columbia	3	0	0	0
Florida	57	1	36	13
Georgia	129	3	64	70
Hawaii	4	0	2	0
Idaho	53	1	31	2
Illinois	414	4	264	98
Indiana	238	0	143	72
Iowa	219	4	176	51
Kansas	146	8	102	54
Kentucky	91	3	55	14
Louisiana	51	2	26	24
Maine	97	2	60	4
Maryland	44	0	28	7
Massachusetts	148	2	58	26
Michigan	271	2	171	108
Minnesota	190	3	143	99
Mississippi	80	0	45	41
Missouri	187	6	120	65
Montana	44	0	26	2
Nebraska	128	3	90	38
Nevada	17	0	10	0
New Hampshire	60	0	32	3
New Jersey	96	1	21	9
New Mexico	21	0	15	2
New York	388	3	179	50
North Carolina	104	2	53	40
North Dakota	39	1	36	9
Ohio	307	2	174	111
Oklahoma	107	2	60	40
Oregon	78	3	51	7
Pennsylvania	358	0	177	40
Philippine Islands	3	0	2	0
Porto Rico	5	0	3	0
Rhode Island	11	0	0	1
South Carolina	60	1	27	18
South Dakota	58	2	49	9
Tennessee	93	2	57	26
Texas	254	2	193	13
Utah	42	1	21	13

State	Number of Companies	Number of New in This Issue	Number Carrying Electrical Supplies	Number of Municipal Plants
Vermont	69	1	42	12
Virginia	34	0	42	16
Washington	105	3	81	9
West Virginia	59	1	30	6
Wisconsin	225	4	157	68
Wyoming	25	1	18	2
	5769	86	3460	1372
Canada	450	5	235	144
Mexico	67	0	38	0
West Indies	7	0	4	0
Republic of Panama	2	0	1	0
Total	6295	91	3738	1516

Number of plants having only direct-current circuit, 889; number of plants having only alternating-current circuit, 3997; number of plants having both direct-current and alternating-current circuit, 783; number of hydro-electric plants, in whole or in part, 1285; number of plants supplying steam for heating, 267; number of plants reporting manufacture of ice, 231.

The investment in the industry is capitalized to-day in the United States at about $2,500,000,000, and the earnings are currently estimated around $350,000,000. There can be no great exactness to these estimates, as the government census of central stations will not be taken until next year, and the last United States report is that of 1907. The earnings are probably higher than here indicated, if the percentage dues paid by member companies are any criterion, or the returns furnished to various Public Service Commissions, but it must be remembered that the natural gains from larger output are constantly offset by voluntary reductions in rates. The output from 2,221,773 kw of dynamo capacity in 1907 was nearly 6,000,000,000 kw-hours. Both figures have probably doubled by this time, and 12,000,000,000 kw-hours at only 3 cents would give a gross income of $360,000,000. The average rate is probably somewhere between 3 and 4 cents. It would not be surprising if the total central-station income in the United States to-day is nearer $400,000,000.

FOREIGN COMPARISONS

England and Germany

Its valuable tables of British central-station connected load were published last January by the London *Electrician* as usual. It would appear that there is a steady but not large increase. In London the connected load at the beginning of the year was

396,488 kw, and in the "provinces" 1,172,189 kw. In 1909 the provincial load first ran about 1,000,000, so that the gain has been about 10 per cent in the elapsed period. In London, companies have about two-thirds of the load; in the country, municipal plants have about three-quarters of it. In the United States, 85 per cent of our plants are in places of less than 5000 people. In the United Kingdom, conditions are reversed, and fully 75 per cent serve towns of over 10,000 population. The *Electrician* tables total 493 undertakings, and the total, including all power-transmission systems, is somewhere between 500 and 600.

In such respects Germany makes a much better showing, Herr G. Dettmar giving figures in March, 1911, of 2526 stations, as compared with 1978 in 1909; while in April, 1911, 698 stations were said to be under construction, which, if true, is something even this country could not equal, though probably most of them were very small. It is a striking fact that of the 2526 plants, no fewer than one-half, or 1437, were without competition from gas works, an evidence of the small size of the community served.

According to the *Verband Deutscher Elektrotechniker*, in a report of April, 1911, of these 2526 stations, 70 per cent were owned privately and 30 per cent were owned by municipalities or provinces; and 2053 of them were devoted exclusively to electricity. The others were or had "side lines." The reporting stations had a total of 2,477,849 kw of connected load, with a plant capacity of 1,466,418 kw back of it. Of the load, only 810,046 kw was in incandescent lamps, and 130,175 kw in arc lamps. The number of kw-hours sold by 543 of the plants was 1,245,541,000, being an increase of 31 per cent in two years, as compared with an increase of 15.8 per cent in 1910-11 in the volume of gas produced by German gas plants.

The conditions of public lighting in England and Germany would indicate that electricity in Europe has not yet come so fully into its own as in America. To quote: "During 1911 the Common Council of the City of London came to a decision regarding the street lighting of the area under their control. The result is in the nature of a compromise—both gas and electricity are to be used to a greater or less extent, the former in the majority of the main streets, *and the latter in the side streets.* Manchester, on the other hand, is still in the throes of a struggle regarding which system of street lighting is to be employed. Both electricity and gas are now being used *experimentally,* and *the result of the trial is not yet known.*" If electricity, after forty years, had gone no further than the side streets and experiments whose results are still uncertain, we might well feel discouraged. To read such things gives the same sensations as reading accounts of the "trial" of Joan of Arc.

Valuable data as to the actual conditions of street lighting in London, Berlin and Paris are given in a series of articles in the London *Electrical Review* by Mr. L. Crouch. Table I contains his summary of illumination values recommended by various authorities for London, Paris and Berlin streets. The ratio of maximum to the minimum illumination falls as low as 5 in certain of the main Berlin streets where flame-arc lamps of the latest type are used. This remarkably uniform illumination

TABLE I—AVERAGE ILLUMINATION ALLOWANCES IN LONDON, PARIS AND BERLIN

	MINIMUM Foot-candle	MAXIMUM Foot-candle	MEAN Foot-candle
Smallest side streets....	0.0085	0.85—1.28	0.13—0.26 or 0.34
Fairly busy streets......	0.128	4.25	0.425—0.85
Main streets	0.170—0.255	8.5—12.8	1.70

TABLE II—APPROXIMATE PRESENT USE OF VARIOUS LAMPS IN STREET LIGHTING IN THE UNITED KINGDOM

INCANDESCENT LAMPS

Carbon Filament

16 cp and under	3,000
25 cp to 50 cp, inclusive	1,700
Miscellaneous	3,600

Nernst

0.5 amp	980
1 amp	150
Miscellaneous	570

Metallic Filament

16 cp	1,300
25 cp to 50 cp, inclusive	10,900
100 cp	2,500
200 cp to 1000 cp	400
Miscellaneous	37,000
Carbon and metallic filaments mixed	12,900

ARC LAMPS

Inclosed

5 amp. to 7 amp	1,000
Miscellaneous	2,400

Open	
5 amp. to 7 amp.	720
7 amp. to 10 amp.	6,400
12 amp. to 15 amp.	1,150
Miscellaneous	3,400
Flame	
8 amp. to 10 amp	1,500
Miscellaneous	2,200
Mixed arc lamps	8,500

TABLE III—PERCENTAGE VALUE OF VARIOUS ANNUAL CHARGES

	PERCENTAGE VALUE OF			
Type of Lamp	Capital Charges	Energy	Renewals	Attendance
Ordinary arc	6.0	81.8	3.6	8.6
Flame arc	10.8	50.6	23.2	15.4
Metallic filament	7.1	79.6	11.7	1.6
Carbon filament	9.7	82.3	5.7	2.3

is attained by the use of high candle-power units mounted at great height. In Table II is given an approximate estimate of the number of lamps of various kinds used for street lighting throughout the United Kingdom. In Table III are shown relative values for interest on investment, cost of energy, renewals and attendance for various types of lamps under London conditions.

Conditions in Switzerland

Figures lag behind when one comes to other European countries. This Report last year gave 607 supply stations as the development in Switzerland; the figures for 1909 show 675 plants that sell electrical energy—228 stations have their own generating plant, 64 stations buy part of their energy from other stations, while 383 stations buy the whole energy from others. Of these stations which have their own generating plants, complete data are available from only 176 stations. Of these, 90 stations are pure water-power plants with a rating of 11,426 kw, or 40.5 per cent of the total: 66 are combined water-power and steam stations with a rating of 156,612 kw, or 57 per cent of the total; 5 stations are operated by steam only with a rating of 1012 kw (0.4 per cent); 13 stations have internal-combustion engines (1280 kw), and 2 stations have steam and combustion engines (4500 kw). The largest rating of a station is 31,380 kw. There are 58 stations from 100 kw to 500 kw, and 61 stations with ratings below 100 kw. Seventy per cent of the total equipment rating is installed in plants with more than 5000 kw. The first cost for 61 stations with ratings below 100 kw was, on the average, $599 per kilowatt, while the average for the stations above 1000 kw was only $240 (the figures in the latter case varying between $168 and $334). Compared with respect to the type of prime movers, the first cost per kilowatt was $191 for water-power plants, $279 for combined water and steam plants, $480 for pure steam plants and $595 for gas-engine plants. Nineteen and three-tenths per cent of the plants generate direct current only, 66 per cent single-phase or polyphase currents, 15 per cent both direct current and alternating current. Fifty-three per cent of all long-distance lines are on the 3-phase system, 4 per cent on the 2-phase system, 32 per cent on the single-phase system and 12 per cent carry direct current. The maximum e.m.f. for long-distance lines is 50,000 volts (Brusio) for alternating-current transmission, and 25,000 volts (St. Maurice to Lausanne) for direct-current transmission systems. The latter example is quite unmatched by anything in America.

Austrian Central Stations

There were in Austria, July 1, 1911, 740 stations with an aggregate rating of 378,736 kw, against 675 stations with 318,614 kw in the preceding year. Of these, 287 stations were municipal; 453 were owned by private persons or corporations. Of these stations 332 were operated by water-power, 129 by steam-power, 77 by gas, 92 by water and steam, 54 by water and gas, 19 by steam and gas, 11 by steam, water and gas, and 26 buy electricity in bulk; 425 stations use overhead wires, 21 cables, 216 cables and overhead lines, while no information about this point is available from 78 stations. Of 451 direct-current stations, 203 use a 2-wire system, 246 a 3-wire system and two a 5-wire system. The table gives information on the rate systems in use. Among the stations using a meter rate with discount there are seven stations with a double-rate system.

	NUMBER OF STATIONS	
	For Lighting	For Power
Meter rate without discount	150	138
Meter rate with discount	142	135
Flat rate	206	128
Mixed rate (meter and flat rate)	134	94
No information available	108	245
Total	740	740

In the city of Vienna there were, in 1900, three stations owned by companies with 1,102,000 connected lamps and producing 27,500,000 kw-hours. Now there is only one station owned by a company with 432,000 connected lamps and producing 8,400,000 kw-hours, and besides this the municipal central station, which supplies energy for lamps and motors (not including traction) and produces 44,421,000 kw-hours, the connected lamps numbering 2,077,000. The receipts of the three privately owned companies in 1900 were $1,115,000, while the receipts of the municipal station in 1909 were $4,760,000. The receipts of the one station owned by a company were $780,000.

Russia and Japan

The only other two countries in regard to which recent figures are available are Russia and Japan. There are only 62 central stations in European Russia. On the other hand, St. Petersburg has the largest number of incandescent lamps in use in proportion to population of any city in Europe, being 440 per 1000, as compared with 240 for Vienna, 185 for Paris, 184 for London and 176 for Berlin. The corresponding figure for the Borough of Manhattan, New York City, is over 2000, and for Brooklyn over 1000. The rates per kw-hour in Russia vary from 12½ cents for Kiel to 16½ cents for St. Petersburg and 25 cents for Moscow.

At the end of June, 1911, there were 367 different electrical companies operating in Japan, representing a total capitalization of $225,423,000. Plants under construction represent $167,767,000, and projects on which work has not yet commenced call for $53,470,000. Of the latter, 127 are electric light and power plants and 19 electric railways. Of capital advanced by Japanese banks during the past year to industrial enterprises, amounting to $15,350,000, more than half ($8,900,000) was to electrical companies.

REGULATION AND RATES

Public Service Commissions

The year has witnessed a marked extension of the principle and practise of regulating public utilities by public service commissions, the underlying idea being the same in all cases with a wide variety in methods of application. The two most notable additions at this writing are the new commissions of California and Ohio, although the subject is up again in the District of Columbia, and has been seriously agitated in a number of States, North, South and West. In one or two instances, as in Maryland, the commission has been sharply called upon to prove its "going value" to the public, and to declare dividends before it has barely got into operation.

In California the new law makes use of the wide plenary powers granted the Legislature by the new constitutional amendment. It is modeled after the public utilities measures of New York and Wisconsin. The State Railroad Commission is increased from three to five members, appointive by the Governor, with an annual salary of $6000 each. The three present incumbents will serve out the period for which they were elected by the people, and two additional commissioners have been appointed. The power of the commission is augmented to include all public utilities, which term the bill defines as including "every common carrier, pipe-line corporation, gas corporation, electrical corporation, telephone corporation, telegraph corporation, water corporation, wharfing and warehouseman, as those terms are defined in this section, and each thereof is hereby declared to be a public utility."

The commission has the power to fix rates for service, to regulate the standards of equipment and service, to review all stock and bond issues offered for sale, and to see that funds so derived are invested as stipulated. It has the authority to annul bond issues upon evidence of fraud or possible injury to investors, and to prevent over-capitalization. A drastic measure of the bill denies corporations the right of appeal from the commission's ruling on writs of certiorari; it is provided that such appeals may go before the Supreme Court only on questions of law and not of facts, the latter being determined solely by the commission, which may adopt its own procedure in taking testimony and is not governed by rules of evidence. In the application of street railway a "certificate of public necessity" must accompany a petition. The law provides that municipalities may at a special or regular election vote to retain jurisdiction over the public utilities within the corporate limits. The Legislature appropriates the sum of $210,000 for the use of the State Railroad Commission in carrying out the provisions of the law.

The new commission law in Ohio has been defined by Mr. D. L. Gaskill, secretary of the State Association and a lawyer of prominence, as being far from satisfactory, because, while of some benefit to both the public and the central station, it is largely "the handiwork of the demagogue and the lobbyist." It does not protect from competition, but regulates service and rates, and about the only thing that can be done without first getting consent is the borrowing of money on notes running not longer than one year. At the same time, as to rates, there are clauses that protect a company against a person who insists on getting a special rate and that allow any reasonable classification of business, so that competition can be made on fair and even grounds. Section 46 provides that the council of any municipality may at any time within one year from the expiration of a contract heretofore made fixing the rate at which the utility would sell its product proceed to fix such rate; and, if unsatisfactory to the utility, it may within sixty days file complaint before the commission, or, if unsatisfactory to the electors of the municipality, 1 per cent of them may file a complaint in such time and a hearing shall be had thereon after thirty days' notice. If the rate fixed by the council is considered by the utility as satisfactory and it has accepted the same, then 3 per cent of the electors may within sixty days file a complaint upon which the usual hearing will be given. The filing of a complaint by a utility shall be held to be a consent of the utility to continue to furnish its product during the entire time fixed by the ordinance after the hearing is had thereon. Mr. Gaskill says that this section was due to the natural gas companies and will be declared invalid as soon as the courts get at it. Where complaint is made to the commission by the utility of a rate fixed by the council, it may elect to charge the rate in force immediately prior to the new rate so fixed, but an undertaking must be given to refund to the consumers the overplus charged if the complaint is decided against the utility. About the only comfort to the electric light companies of the State in this section is a provision for an appeal.

Incidentally, it may be noted here that the Ohio State Tax Commission has decided to require all private concerns selling electrical energy to consumers to list their properties for taxation on the same basis as gas and electric companies are required to do. Acting upon this idea, blanks have been sent to various concerns that own and operate large office buildings, with instructions that their entire properties be listed on this basis. It is said that there are twenty-five such private plants in Cincinnati. The commission exempts companies which furnish energy to tenants as part of their rent.

The Results of Commission Rule

At the Conference of Governors held at Spring Lake, N. J., last September, Governor McGovern, of Wisconsin, made an interesting address on the routine administration and results of the Wisconsin commission law. The genuinely constructive and enduring character of this method of control is best demonstrated, he held, by the fact that while the people have gained enormously, the utilities have not suffered. On the contrary, they have prospered as never before. Lower rates have not been followed by diminished income, but, by inviting larger patronage, have resulted instead in an actual increase in revenues. To the utilities, therefore, the net outcome has been a gain. As evidence of the prosperity under commission regulation, the last annual report of the Wisconsin commission shows that during the year the operating revenues of electric utilities increased 20 per cent, their net income 29 per cent, and new construction for the year 145 per cent. The operating revenues of water utilities meanwhile increased 7 per cent, their income 13 per cent, and new construction 24 per cent. Gas utilities increased their operating revenues 3 per cent, their net income 15 per cent, and new construction 24 per cent. Telephone utilities increased their operating revenue 11 per cent, their net income 9 per cent, and construction for the year 14 per cent. Railway and traction lines on the average increased their operating revenues 13 per cent, their net income 8 per cent, and construction an equal amount. All utilities in Wisconsin are in a more flourishing condition now than ever before and are planning to extend their operations far into the future.

Taking a longer period, as in the case of railway regulation, which was begun earlier, the results are even more striking. For the fiscal year ended June 30, 1905, the total mileage of railroads in Wisconsin was 6931, and the total operating revenue $50,144,702.43. This was the year immediately before commission regulation of railroads began. Five years later, or during the fiscal year ended June 30, 1910, the total mileage had increased to 7209, an increase of 278 miles, and the total operating revenues amounted to $65,055,928.76, an increase of nearly $15,000,000. Thus, notwithstanding the decrease in transportation rates and improvement in service enforced by the Railroad Commission, the operating revenues of the railroads of Wisconsin increased, approximately, 30 per cent. As an indication of the general prosperity of the State meanwhile it may be worth mentioning that under these new policies the deposits in commercial and savings banks in Wisconsin increased, in round numbers, during this five years from $187,000,000 to $276,000,000, or 51 per cent.

How these results are possible may be illustrated by the case of the Madison Gas and Electric Company, which in this respect may be considered fairly typical. In March, 1910, this company's schedule of rates, based as it was entirely upon the energy consumed, was abolished and there was substituted a new schedule which took into consideration the elements of amount of installation, classes of consumers, as well as the amount of energy used. In actual experience the form of rate schedule is as important as the rate per unit; and it is the policy of the commission to devise schedules which, while avoiding discrimination and unjust charges, will at the same time encourage extension of the service and thereby decrease the cost per unit. After one year's operation of the new schedule another investigation was made, and it was found that, compared with 1909, the last current year in which the old rates were in effect, the output of the electric plant had increased over 16 per cent, the gross earnings nearly 13 per cent, the net earnings 24 per cent, while expenses increased less than 3 per cent. Compared with 1907, the number of consumers in the residence class had increased 34 per cent, the number of lamps connected 54 per cent, the kilowatt-hours sold 70 per cent, and revenue 35 per cent. Here, however, is the important point; after a year's operation under the commission's schedule, it was found that the business had so increased that it was possible to effect a further reduction in the primary rate of 2 cents per kw-hour and make a net cut in the revenue of the company of $24,000.

In an address before the National Electric Light Association Section in Chicago, Mr. H. M. Byllesby said that public opinion in this country is rapidly crystallizing in the idea that a public utility should be a regulated and protected monopoly. This is no news to those who have been following the trend of public thought and legislation, but it expresses concisely a gratifying fact. While it is too much to expect that the regulation of public-utility companies in the future will be accomplished altogether without friction, or that the commissions charged with the responsibility of such regulation will always be ideal in their make-up, yet unquestionably there is now general recognition of the principle that competition in public utilities is not a suitable means for checking corporate abuses and is both damaging to the capitalist and a general nuisance to the public. When the majority of the public-utility laws were drawn up, the fact was recognized that if public-service corporations were to be controlled and regulated, they must at the same time be protected. In general, this protection is afforded in two ways—protection from the ruinous effects of aggressive competition where circumstances do not warrant a second utility and an assurance of a reasonable rate of return upon an equitable valuation to reward an adequate service rendered. The first is made possible through the agency of the so-called "convenience and necessity law" which is operative in most States under commission control. The law recognizes that a public-service corporation is, in its very nature, monopolistic in character, and protects it from competition except where the public welfare demands the existence of a second utility. The utility commission in administering the law determines whether such a second utility is necessary or not. This provision, as Chairman Roemer, of the Wisconsin commission, has put it, is not intended as auxiliary to the power of the commission to enforce rates and service, as is sometimes erroneously assumed, but is a remedy of last resort and may be applied only in exceptional cases. In Wisconsin not a single certificate of convenience and necessity has ever been granted to an electric central station, although several requests for such have been made. Under this law it is impossible, practically, for a municipality to operate its own plant in competition with an existing private plant. Under certain conditions the municipality has the right under the law to purchase the private plant at a valuation fixed by the commission. Very few municipalities have availed themselves of this opportunity, for experience has shown that where the public can obtain all the advantages of public ownership without any of the disadvantages it is good policy to keep out of the electric central-station business.

Along these lines the New Jersey commission declared itself last year. On September 15, 1910, the Atlantic Highlands Gas Company filed a petition seeking to obtain a franchise in order to supply gas to the inhabitants of Shrewsbury Township, Monmouth County, N. J. About two months later a fifty-year franchise was granted by the township committee and accepted by the company. However, it appears that the Consolidated Gas Company of New Jersey had been previously granted a franchise for Shrewsbury Township. This franchise was granted in 1895, and for a number of years the Consolidated company has supplied gas through pipes laid in Shrewsbury Township. Furthermore, it was shown that the Consolidated company was laying pipes to supply gas to much the same section of the township as the Atlantic Highlands Gas Company desires to serve. The conflict was referred to the Board of Public Utility Commissioners of New Jersey, and in a decision handed down May 31, 1911, the board announced that it withheld its approval from the franchise granted to the Atlantic Highlands Gas Company. It was stated that the commissioners could not find that the franchise conferred by the recent ordinance is "necessary and proper for the public convenience" nor that it "properly conserves the public interests." In its opinion accompanying this decision the board says that the creation of various boards and commissions with supervisory powers over public utilities demonstrates that the illusive doctrine of competition in the field of public utilities is being superseded by an experimental régime of strictly regulated monopoly. Often the competition in the end results in increased prices to consumers. There appeared to be no exceptional circumstances in the Shrewsbury case, and the addition of a competing company with permit to supply like service in the same general region would involve sanctioning the general idea of competition.

The Public Service Commission of Kansas has handed down this year a decision which is regarded as very important in its bearing upon the status of all the public utilities in the State.

Under the law of 1911, no utility can operate until a certificate has been obtained from the commission that public convenience and necessity will be subserved by permitting it to enter the field where another utility of the same kind already exists. The Parsons Railway and Light Company, according to the evidence, was giving satisfactory service from an adequate plant, but an application was made for permission to enter the territory and compete. The commission said that the obvious purpose of the law was to prevent a duplication of utilities, under such circumstances; and it denied the certificate. The Public Policy Committee of the N. E. L. A. furnished a brief from Mr. E. W. Burdett, counsel of the Association, which proved of great help in defending the interests of the local company.

The general tendency of the times toward the consolidation of existing electric central stations has met with approval by the several commissions in cases where the mutual interests of utility and consumer would be advanced by such consolidation, and in all cases the total capitalization of the new company has been passed upon before authority has been granted. In some instances, as in that of the Public Service Company of Northern Illinois or the Adirondack Electric Power Company, the new consolidated capitalization of such companies has been less than the old. On the other hand, the evils of high operating costs, extravagant investment and over-capitalization which may attend the exercise of control by a holding company have been recognized by the commissions and an increasing vigilance has been evidenced in all investigations of this question. In the case of the North Adams Gas Light Company, decided by the Massachusetts Gas and Electric Light Commission, it was pointed out that the high price of the company's products was due very largely to the excessive sums paid by the North Adams Company to the holding company for engineering services, salaries of executive officers and supplies purchased through the holding concern, with the result that the charges were increased beyond what they would have been had the company been conducted as an independent concern.[1] In like manner the Wisconsin Commission held in the Beloit Gas and Electric case that the consumers had been paying interest upon a capitalization which included an item of over $300,000 for "promotion expenses" and also upon an obviously extravagant plant investment. This investigation disclosed the fact that the ultimate capacity of much of the station equipment and distribution system would not be reached, even with a very liberal allowance for future growth, until long after the period of useful life was ended. These excessive costs and values, as in the North Adams case, were, however, liberally discounted in arriving at a reasonable basis for rates, and in each case the rates were reduced. A significant decision, and one in keeping with a broad policy of public-utility regulation, was the decision by the Wisconsin Commission in the case of the Pewaukee-Sussex Telephone Company, where the commission put a premium upon excellent service and reasonable rates, combined with a very economical management, by permitting the company to enjoy a 12 per cent rate of return upon its investment. As to certain elements which should properly be classed as a capital charge, there seems to be difference of opinion. The New York commission has held in the Queens Borough case that going value, for instance, ought to be classed as an operating expense and gradually written off through a period of years. It might be stated in this connection that in the majority of cases this principle has evidently been followed by the more progressive utilities, since no reliable evidence has been introduced at any hearing to show that the early deficiencies had not been thus taken care of. The Wisconsin commission, while holding that going value should be classed as a capital charge, has applied this principle only in determining whether or not a public utility was entitled to an allowance for going value and has not applied it directly in any specific instance. The commissions seem to be divided upon the principle of allowing utilities to enjoy the benefits of an appreciated land value. It is difficult to see why, in equity, a public utility should not enjoy the same privileges as are accorded any other commercial concern, especially if such increases in real estate reflect the general tendency of the times and location and are not local or abnormal. Viewing this principle from an economic standpoint, there does not seem to be any reasonable ground upon which to deny any public utility the benefits from such an increase. As to "going value" itself, the discussion before the Western Society of Engineers in Chicago last winter showed how many various angles that subject can be viewed from by experts as well as by commissions.

As To Rates

As there is a valuable report from the Rate Research Committee, the subject of rates may be dismissed briefly here. The question of rates and the best forms of rate schedules are still unsettled issues. Two facts, however, have been pretty well established, namely, that a rate schedule which approximately follows the cost of service and which differentiates between the different classes of service seems to give the best satisfaction where it has been applied by commission authority, and that the residence-lighting business, if properly developed, may be a profitable source of revenue. It has been amply demonstrated by the cases in Wisconsin already referred to that the residence-lighting business responds very naturally and in a very striking manner to this form of rate schedule, and will result in a marked increase in consumption and net revenues with but a small increase in connected load.

A committee report of the Empire State Gas and Electric Association on the gas and electric schedules of the Second District Commission of New York called attention this year to certain interesting facts in public utility rates and service that must not be overlooked. The public-service corporations and municipalities operating gas and electric plants produce and sell the commodities gas and electricity, but are permitted to do so only under the condition that an adequate supply shall be available at all times to meet the demands of the public. They therefore also render a service, and in this connection the word "service" is commonly used to include both the commodity and the availability of the supply. It consists of not only the commodity but also the plant capacity, which may be drawn on at any time. The extent of the service furnished to the consumer consists, therefore, of the quantity of gas and electricity consumed plus the amount of plant capacity maintained on his account and subject to his demand. These two fundamental factors, to which the committee refers as quantity and demand, constitute the basis of all methods of charging.

Gas and electric service may be sold under different conditions. These conditions create six fundamentally different kinds of service, as follows: Continuous service, which is available at any and all times; limited-period service, which is available only at certain specified hours or seasons; optional service, which is to be rendered or discontinued for periods at the call of either the producer or the consumer; re-sale service, which is furnished by one corporation or municipality for distribution and re-sale by another; auxiliary service, which is rendered for limited or unlimited periods as auxiliary to the consumer's plant, and emergency service, which is rendered only in case of break-down of the consumer's plant.

Certain characteristics are more or less constant for all installations in which the uses of the service are the same or very similar. Such facts must be taken into consideration in rate-making. In a description of the various classes of service it is necessary that the kind of service should be stated, and that the circumstances and conditions surrounding the use of the service should be indicated clearly.

Some details were given in this Report last year as to the valuation of the property of the Union Electric Light and Power Company, of St. Louis, and the scale of rates based thereupon by the local Public Service Commission and objected to by the company. Judge C. C. Allen, of St. Louis, in a decision handed down on February 12, held that the ordinance passed at the instance of the Public Service Commission, enacting that 9.5 cents should be the maximum rate for electrical energy sold in that city, was void. The city was enjoined permanently from enforcing the ordinance. The main issue on which the case was decided in the Circuit Court in favor of the Union Company rested upon the legal interpretation of the word "fixed" in the Cooper Public Service Act passed by the Missouri Legislature in 1907. The ordinance forming the basis of the suit was attacked by the company on several grounds, but the principal issue was on the question whether it harmonized with the wording of the Cooper act.

The law provides that public-utility corporations may charge no more for their utilities than "such rates as shall be fixed from time to time by ordinance by the cities in this State in which such utilities are operated." Cities are given authority to fix by ordinance the rates of charge for the services of such utilities, provided that the rates are reasonable and that they are not changed oftener than once every two years. Under this law, by a city ordinance approved April 12, 1911, it was declared that the maximum rate of the Union Electric Light and Power Company, of St. Louis, and of the other electric-service companies of that city should be 9.5 cents a kw-hour.

In its motion to have made permanent a temporary injunction to prevent the city from enforcing this ordinance, the company contended that the ordinance in question did not "fix" the rates, but sought to regulate them by a maximum rate, and therefore was not in strict compliance with the State law. The attorneys for the city insisted that this contention was merely a legal quibble and that the spirit of the St. Louis ordinance was in harmony with the spirit and intention of the framers of the Cooper act. Judge Allen overruled their arguments, however, and upheld the contention of the company.

Reference was also made last year to the rate situation in Los Angeles and the arbitrary fixing by the city council of a base rate of 7 cents instead of 9. The Southern California Edison Company offered a base rate of 8 cents and a monthly minimum of 75 cents instead of $1.00. But last August the council had its way, and has enforced the 7-cent base rate and a minimum of 75 cents with no meter charge. For motor service a minimum charge was fixed of 50 cents per month per horsepower installed and not less than $1.00 in any one case. A protest was filed from the company, but that did not make any difference. It stated that the proposed rates would prove insufficient to produce the income necessary for the proper conduct of the business, but why should the public care particularly about that when it can fix for itself the rates at which it is willing to take service? It would be interesting to see such a principle carried to its logical conclusion in respect to other services and commodities. The advantages of a State commission in this respect over a local one seems rather obvious, but there is a vogue in local commissions just now.

Last January the Toledo (Ohio) Railways and Light Company filed its acceptance of a lighting ordinance which provides for a rate of 8 cents per kw-hour, with a discount of 1 cent on all bills paid by the 10th of each month. A minimum charge of 50 cents per month is allowed. At first the company refused to recognize the ordinance, and the city secured a temporary injunction compelling the acceptance of the rates. Payments were accepted with the understanding that the city was to make up the difference if it should be decided that the company was entitled to rates according to its own figures. The company offered two plans of service charges to consumers. In the first the company offered to furnish energy to all who use as much as 20 kw-hours per month at 7 cents per kw-hour. The average home, the announcement stated, uses 23 kw-hours a month and, under the new offer, there would be a saving of 23 cents a month over the old rate. It was argued that in order to serve the public at so low a rate each home must bear its proportionate share of the expense of installation and cost of production. For this reason a minimum amount of energy for which each must pay was fixed in the contract. The other plan was to fix a flat rate of 30 cents a month for not more than three rooms and 10 cents a month for each additional room, after which a charge of 7 cents per kw-hour would be made for the first 10 kw-hours and 5 cents per kw-hour for the remainder of the energy furnished. This latter plan was for those who use energy for both lamps and motors for household purposes. In that case there would be no minimum charge of 50 cents per month, and the householder would pay only the 10 cents a room in case he closed his home for a time in the summer when the family is absent. Both these propositions sound reasonable.

On October 15, 1911, the Cincinnati Union Gas and Electric Company put into force a new schedule which in application embodied many interesting features. In the first place, the printed schedules of the company, with statements of all conditions, riders, etc., and general information to customers, are arranged in booklet form, into which is bound the customer's duplicate of his contract, the original being kept by the company. This 32-page schedule booklet is of standard document size, 4 in. by 9 in., so that it can be filed if desired. With a single motion in this way the company places in permanent form in the consumer's hands both its contract and rule book, inviting the fullest study of its rates to all its customers and insuring that the rule book will be preserved with the care given the contract.

Service under the new rate schedule is divided into eight classes, lettered A to H, limiting which are fourteen standard "riders" or clauses, which are noted down and agreed to in the contract blank and fully explained on the following pages of the booklet.

In general the new Cincinnati schedule involves a small revision downward of the former rates. A monthly "maintenance and inspection charge" of $1.00 per kilowatt of lighting demand and 75 cents per horse-power of motor demand is now made with the approval of the Public Service Commission, this charge being waived when the monthly bill, based on the kw-hours consumed, exceeds its amount. For residence lighting 70 per cent, and for business houses 90 per cent, of the connected load is taken as the demand. The motor demand ratio ranges from 90 per cent under 5 hp to 55 per cent over 100 hp, all elevator motors being estimated at 60 per cent of their rating. Five per cent discount on all bills is allowed for payment within five days of date rendered.

The following has been suggested as a good method of setting forth a typical rate system.

> Electric lighting rate: 14 cents per kw-hour for electrical energy used equivalent to thirty hours' use per month of the consumer's maximum demand, the maximum demand being estimated by the rules given below. For electrical energy used in excess of one hour's use per day of the consumer's maximum demand, 6 cents per kw-hour. Minimum bill, $1.00 per month.
>
> The following are rules for estimating the maximum lighting demand:
>
> For stores, offices, depots, restaurants, livery stables and all places of business where all the lamps are lighted during the company's heavy-load period, that is, from 5 to 6 P. M. in winter, the maximum demand shall be counted as the full connected capacity of lamps.
>
> For hotels and boarding houses, public halls, churches and theaters the maximum load shall be counted as one-half the connected capacity in lamps.
>
> For residences, count the maximum demand as 40 watts for each room in the house, exclusive of bathroom, basement, porches, stairways, attics, storerooms, small halls, entrances, woodshed and barn. Small motors of ½ hp and less and electric irons or other heating appliances are not counted.
>
> Unlimited power rate: 12 cents per kw-hour for electrical energy used equivalent to thirty hours' per month of the consumer's maximum demand, the rules for estimating the maximum demand being given later; 6 cents per kw-hour for electrical energy used in excess of the foregoing amount.
>
> Off-peak power rate: Power consumers agreeing not to operate motors between 4.30 and 8 P. M. during November, December, January and February will be given the regular

unlimited power rate less 4 cents per kw-hour on the 12-cent portion of the bill.

Minimum bill, $1.00 per horse-power connected per month.

The rule for estimating the maximum-power demand of a consumer is to take 1 kw per horse-power of motor connected, except where a motor is much underloaded and consumer desires a test. In such case the company will make a test for such period as seems to it best to determine the real maximum demand.

Typical of older methods in rate making but approved by modern commissions is the new scale put into force last July by the Edison and United Electric Light and Power companies of New York. Like the scale which preceded it, the new system is shorn of all technicalities and is simple, the consumer paying a straight rate regardless of maximum demand, or when or how the energy is used. Such discounts as are available are based on the quantity of electricity consumed. The general rate available to all consumers is as follows:

			Per Kw-hr.
For the first	250	kw-hrs. of monthly consumption...............	10c.
Next	250	" " "	9c.
"	250	" " "	8c.
"	250	" " "	7c.
"	500	" " "	6c.
Excess over	1,500	" " " for the excess.	5c.

These rates include carbon electrodes for and trimming of arc lamps, the supply and renewal of all standard incandescent lamps, or an equivalent allowance in the price of tungsten and tantalum lamps. Where advantageous to the consumer, energy for motors may be included under the general rate. Customers making a yearly contract who agree to an average monthly use of not less than 1500 kw-hours, including energy used for motors if desired, may renew their own incandescent lamps, supply electrodes for and trim their arc lamps and otherwise care for their installations. For so doing they will receive a special discount of ½ cent a kw-hour.

The schedule of rates for energy consumed by motors is as follows:

			Per Kw-hr.
For the first	200	kw-hrs. of monthly consumption...............	9.5c.
Next	200	" " "	8c.
Next	2,500	" " "	6c.
Excess over	2,900	" " " for the excess.	5c.

What is known as the "wholesale rate," which applies to those consumers requiring over 100,000 kw-hours per annum and is covered by a guarantee to use not less than that amount, is as given below:

First 100,000	kw-hrs. yearly consumption	5c. per kw-hr.
Next 100,000	“ “ “	4c. “ “
Over 200,000	“ excess yearly, at	3c. “ “
500,000	“ yearly consumption, not to exceed	$17,500
625,000	“ “ “ “ “	20,000
833,333	“ “ “ “ “	25,000

The only concessions made from the schedules as given above apply to automobiles, storage batteries and electric refrigeration. In order to encourage the use of electric automobiles and of electric refrigeration, the following favorable rates are held out by the company:

		Per Kw-hr.
For the first 2,500	kw-hrs. of monthly consumption	5c.
Next 2,500	“ “ “	4c.
Excess over 5,000	“ “ “ for the excess.	3c.

The schedule is dependent upon a minimum monthly bill of $25 and includes the agreement that where the amount of energy used does not exceed 50,000 kw-hours monthly the cost shall not exceed $1,500.

The contrast between Cincinnati and New York in rate making is certainly most striking, but, despite superficial indications, there is a deep underlying tendency toward uniformity of result, and toward conditions that are absolutely fair and equitable in dealing with the respective communities—toward “a square deal.”

In connection with the subject of rates and taxation, Mr. R. M. Searle, Vice-President of the Rochester Company, made an interesting suggestion last October before the Empire State Association. He proposed for serious consideration by the companies a plan whereby the taxes may be shown on each bill rendered to a consumer. That is to say, the total amount of each customer’s bill would be divided between the total charge for the service and the proportionate taxes which would accrue in each case. The Rochester Railway and Light Company, Mr. Searle added, would be perfectly willing to introduce a system of this character, believing that it would show the facts in relation to questions of taxation more clearly than any other means that have been considered. The present form in which taxes are levied upon public-utility companies is a form of indirect tax upon the community, because whatever taxes are levied are added in turn to the cost of the service rendered. However, as taxes are now levied they are not shown in such detail that the consumers realize the extent to which they are burdened. If a public-utility company pays an amount of taxes in a community greater in proportion than other companies or individuals, it simply collects the taxes from its customers. The larger the tax is in the aggregate, the larger the provision that must be made in expenses for its payment. To levy the tax in this indirect manner compels resident householders to pay a larger proportionate tax than alien owners of property. This is certainly an ingenious way of bringing to the public consciousness the heavy burden of public-utility taxation, which, in the long run, must be part of the rate.

It would be difficult to summarize even briefly all rate changes, and note is confined therefore to a few typical instances. That which is of most recent occurrence, falling later than the preparation of this Report, is due to the action of the Commonwealth Edison Company of Chicago. On all bills computed from meter readings taken on and after April 1, 1912, the net primary rate will be 10 cents a kw-hr. instead of 11 cents as at present. Another reduction will be made on October 1 next, when the secondary rate will be reduced from 6 cents to 5 cents. In 1898 the rates were 20 cents for the primary portion of the bill and 10 cents for the secondary rate. At that time also forty-five hours' use of the maximum was required in a month before the secondary rate was earned. A few years later the maximum-hours requirement was reduced from forty-five to thirty, the present figure. Successive reductions came as follows, the figures being the primary and secondary rates: 1905, 16 and 10; 1906, 14 and 9; 1907, 14 and 8; 1908, 12 and 7; 1909, 12 and 6; 1911, 11 and 6; April 1, 1912, 10 and 6; October 1, 1912, 10 and 5. Thus in a period of fourteen years the rates will have been cut in half exactly. The results have been made possible by reductions in cost of production due to the advancement of the art, by bold and skillful engineering, by enlarging the market in the wholesaling of electricity to large consumers, and by modern methods of selling, building up a better load-factor. The operating revenue for 1911 was no less than $17,336,835, and the output is growing rapidly under the policy outlined above.

MUNICIPAL OWNERSHIP AND PRIVATE COMPETITION

Municipal Plants

The past two years have witnessed a marked revival of activity in the agitation for municipal plants, the popular favor of which seemed to have died out. The condition may be regarded in reality as one of the symptoms of the wave of Socialism that has swept over the country, for one of the chief principles of the Socialistic program has always been the ownership and operation of all utilities by the public. Hence we have seen heavy votes in favor of municipal plants in such large cities as Cleveland and Duluth, and "agitations" or "movements" for similar expenditure of public money in a variety of other places, averaging, perhaps, one per day for the entire country. The Report of the Public Policy Committee, which has been directing its serious attention to this problem during the past year, will probably contain data on the subject. The extent of the influences in this direction may be gauged from the fact that not only has the Government started postal savings banks and has favored postal parcel delivery system, but the Postmaster-General in his annual report has advocated warmly a system of postal telegraphs. It is significant to note, however, that President Taft has commented adversely as follows on the last proposition: "I believe that the true principle is that private enterprise should be permitted to carry on such public utilities under due regulation as to rates by proper authority rather than that the Government should itself conduct them. This principle I favor because I do not think it in accordance with the best public policy thus greatly to increase the body of public servants.

"Of course, if it could be shown that telegraph service could be furnished to the public at a less price than it is now furnished by telegraph companies, and with equal efficiency, the argument might be a strong one in favor of the adoption of the proposition. But I am not satisfied from any evidence that if these properties were taken over by the Government they could be managed any more economically or any more efficiently, or that this would enable the Government to furnish service at any smaller rate than the public is now required to pay by private companies."

It seems to your Committee that the language and arguments of this comment would apply to many or most of the other instances. The conditions of government telegraphy in England, with a gross deficit to date put at over $150,000,000, would not encourage the adoption of such a system here.

Moreover, the data obtainable as to municipal plants in Great Britain is not encouraging to any greater extent. The net earnings, in 1910, on about $200,000,000 of municipal electrical capital are, according to the *Manual of Electrical Undertakings,* $15,766,125; and after paying $5,691,580 in interest, $5,934,555 to sinking fund, $1,568,545 for bad debts and special charges, placing $1,380,210 to depreciation and reserve, and $1,340,400 to taxes, there is a deficit of $149,165. One of the ideas has been to treat imaginary surpluses from these plants as a means of reducing taxes. The city councils have often forced the electricity committees to increase their contributions beyond the limit proposed by the latter, and in this have always been heartily supported by the gas committees, whose members argue that the electricity department ought to relieve the taxes on the same scale as the gas department. The relative claims of these two public-service departments, which are to a large extent competitive, present one of the most critical problems before the local authorities. The effort of the gas committee is often concentrated upon forcing municipal electric undertakings to charge higher prices, to put larger sums to reserve, to pay more to the taxes, and to take no steps in developing business by advertising and kindred methods.

One serious question is that of getting new loans. Not many years ago the process of applying to the Local Government Board for permission to raise money for electrical development was more or less a pleasant formality. Lately, however, it has become a searching inquisition, and there has undoubtedly been a marked effect in checking outlay upon municipal supply undertakings. Central-station engineers have postponed the evil day as long as possible, and they have been inclined to ask sanction for the lowest possible amount rather than for the sum they would like to spend upon the liberal development of their business. At present a local authority has no means of raising working capital except as part of a special loan. A municipality can raise and spend money only on objects specified when the money is raised by application to the Local Government Board. This system is regarded as inappropriate to the conditions of electric supply progress. The amount of working capital required cannot be estimated far ahead, and there is always a reasonable demand for some simple machinery or for extension of mains and plant which will require extra capital to be raised. The same trouble arises here when Public Service Commissions try to compel companies to say in advance how every cent of a new issue of securities is to be spent. Another important question is the securing of power by municipal electrical authorities to wire premises and to sell fittings, motors and cooking and heating apparatus. There is a very strenuous opposition against this by electrical contractors, plumbers, taxpayers' associations and even the gas interests.

Returning to America, it may be noted that the Taxpayers' League of Milwaukee called attention last December to the increased cost of the public lighting by the new plant which the municipality is arranging to build alongside its garbage-disposal station, compared with the outlay for this service under the present contract with The Milwaukee Electric Railway and Light Company. The first cost of the proposed plant and equipment for 2000 lamps, the report points out, will be $823,492.73, according to an estimate by R. W. Hunt and Company, to which must be added at least $60,000 for land sites. A bond issue of $250,000 at 4½ per cent, and 5 per cent mortgages up to $330,000 have been authorized already, and must be followed by another $330,000 issue of mortgage certificates, making the total interest charges $42,750 a year. Depreciation at 4½ per cent will amount to $36,900 a year. The city plant will pay no taxes, entailing a further loss of $13,200 to the city revenues. Allowing $8,800, or 1 per cent, for contingencies and $71,500 for operating expenses, the total annual cost of the municipal lighting will thus be $173,150, or $86.57 per lamp. This street lighting is now being done by the private company at its contract price of $65 per lamp per year, so that the installation of the new plant will entail an increased cost of $21.56 per lamp, or $43,140 a year.

Last year the city of Galveston, Tex., for which Mr. W. D. Masterson is electrical superintendent, entered into a contract with the Brush Electric Light and Power Company, which has a 4300-kw turbine-driven central station, to supply the energy for its 350 magnetite street arc lamps, shutting down the city's new 200-kw steam-turbine plant. The immediate cause of this change is the 10-cent excess premium imposed on all insured property in the city of Galveston as the result of the city lighting plant being housed in the same engine-room as the high-pressure waterworks pumps. The rectifier-transformers were accordingly transferred to another part of the building, and central-station energy to operate them has been purchased at 2.5 cents per kw-hour, practically the same figure as has been the cost of operating the municipal turbine plant using oil as fuel. The good load-factor of the city lighting load, however, has made it possible for the central station to supply this service satisfactorily at this low figure. Electric pumping for the city of Galveston is also contemplated. The water supply for the island comes from a group of artesian wells at Alta Loma, 20 miles inland on the mainland, from which point the supply is piped to Galveston. The plans for electrifying the water supply contemplate installing three 75-hp motor-driven pumps at both the Alta Loma wells station and the Galveston pumping plant, all receiving energy from the Galveston central station.

At Cleveland, while the local company has been subjected to what can only be characterized as a vicious and dishonest attack, under the plea of giving the citizens "three-cent electricity," with the result that a million dollars will probably be spent in putting up a municipal plant, there is some compensation in the announcement that the Cleveland Electric Illuminating Company has purchased the physical property of the Cuyahoga Lighting Company, a concern started four years ago at the instance of the late Mayor Tom L. Johnson, who had at that time declared war against the larger company. He desired this to be the nucleus of a large company which would furnish competition to force the Cleveland Electric Illuminating Company to come to terms with him. Under the terms of this franchise the new company was required to file a bond for $25,000 to insure protection against damage to the streets. When the company was first organized this bond was provided, but in 1909, when an extension ordinance was granted, the bond was not renewed. For this reason the franchise is not effective at this time, so that the purchase involved only the physical property. The company was organized in 1907, and its franchise covered but a limited territory, its business being confined to furnishing energy to buildings in the neighborhood of the public square. The money was furnished from New York. The secretary and manager states that the sale is the natural result of the duplication of capital in an effort to establish competition in this public utility. No one who knows will dispute that statement, but the present Mayor, Mr. Baker, the political residuary legatee of the late single-taxer, carries on the "merry war" just the same.

Two interesting and encouraging instances may be noted from the domain of our sister society, the Canadian Electrical Association. On July 25 the town of Napanee, Ontario, passed a by-law by a vote of 408 to 46 disposing of the municipal electric light plant to the Seymour Power and Electric Company, Limited, of Campbellford, Ontario. The entire plant was in first-class condition, having been constructed in a thorough manner in the first place and afterward well maintained. In selling out to the Seymour Company the town secured a twenty-four-hour service instead of a dusk-to-dawn service, which previously obtained. Moreover, the change was accompanied by a substantial reduction in rates. The street arcs, for each of which the plant was credited with or received $70 per annum, are maintained at a yearly rate of $55. The series tungsten lamps used for street lighting have been reduced in cost from $20 each to $15 each per year. The commercial and residence lighting schedule of rates is reduced from 10 cents per kw-hour to 8 cents per kw-hour. For those who desire it there is an alternative rate for residence lighting of 10 cents a room per month plus 3 cents per kw-hour for the energy consumed. The rates for energy used by motors do not exceed $25 per hp-year for twenty-four-hour service. It is evident that the town has been benefited by the sale, and the new rates should result in the expansion of industries now in the town and the acquisition of other industries. It is an example of what far-reaching power transmission circuits can do in the hands of a well-conducted private enterprise.

The news from Winnipeg is even more startling. The Privy Council in England decided this February in favor of the Winnipeg Electric Railway Company in a case on appeal involving the interests of that company. According to the decision, the railway company, which also owns the electric lighting system, can transmit power to the city from its plants outside and can retain its distributing system within the city. On the strength of favorable decisions in lower courts, the city invested $6,000,000 in a municipal plant, and the property of the railway and lighting company is valued at $25,000,000, the plant outside of the city and the city distributing system being valued at $6,000,000. The litigation between the Winnipeg Company and the city began in 1906, when the city entered action in the Court of King's Bench of Manitoba claiming that the company had no right to use any power that was not developed within the city limits, and that the use of power generated outside the city was in violation of the provisions in the charter and invalidated the franchise of the company. The city also claimed that the company had failed to fulfill the condition of the charter in respect of the operation, conduct and management of the street railway system. The further claim was made by the city that the company had no right to place poles or wires upon the city's streets for the transmission of power generated outside of the city, and the city asked that the company be ordered by the court to remove such wires and poles and forbidden to erect any more. This claim was made as a protest against the absorption of a number of smaller companies, to which the city had granted lighting, power and heating franchises, by the street railway company, as the city had not given consent to the sale of these franchises to the street railway company by the individual companies to which the various charters had been granted in the first place.

The judgment of the Court of King's Bench was partly a victory for the city and partly a victory for the company, the greater advantage being with the city. The case was carried to the Manitoba Court of Appeal, which sustained the findings of the Court of King's Bench. By agreement, the appeal from the Manitoba Court of Appeal was carried direct to the Privy Council in England, skipping the Supreme Court at Ottawa. Briefly, the decisions of the Manitoba courts which were appealed against were: (1) That the company has no right or title to erect poles or wires on the city's streets for the transmission of electricity for any other purpose than street-car operation. (2) That the company must remove from the city's streets all poles and wires for the transmission of electricity for any other purpose than street-car operation. Against these decisions the street-car company appealed to the Privy Council in England.

The third decision of the Manitoba court, which was "that the bringing in of electrical current from the company's plant at Lac du Bonnet does not invalidate the company's franchise, as the current so brought in is like fuel brought in for use in the company's steam plant, the transforming of electrical energy so brought in being the development within the city of the power used for street-car operation," was the only decision which went against the city, for which it was argued that the power was produced at Lac du Bonnet, where the company's power plant on the Winnipeg River is situated, and therefore not manufactured in the city, as the defense argued.

The decision gave the company authority to operate a street-railway service, but cut it off from supplying power and light to the citizens. The company at once appealed from the decision denying its right to erect poles and string wires for commercial purposes, and the city filed a cross appeal against the decision which gave the company the right to generate power for its cars outside the city. It was on this issue that the Privy Council found completely for the company.

The litigation was so heated that it caused the owners of the system to offer to sell their entire plant to the city for $24,000,000, which was refused. The city invested $6,000,000 in a great civic hydroelectric plant and cut the rates of the company from 10 cents to 3 cents per kw-hour. It is now believed that the city will buy the street-railway company's entire interests. Meantime, the city lighting plant, started not long ago with a great flourish of trumpets, has not brought in the millennium, as predicted, and one of the first troubles has been the resignation of practically the entire engineering staff, on the ground of "outrageous political interference"; and it is obvious that there are many serious troubles ahead.

Reference may also be made here, in passing, to the fact that a year ago it was confidently prophesied that the city would acquire the Toronto Electric Light Company. The expected has not happened; but, under new conditions and a vigorous management, the company is showing it can easily hold its own in giving efficient public service under private ownership.

Reference to the subject of municipal ownership in this Report, on the occasion of a visit to Seattle, would not be complete without notice of the severe disaster that fell upon this convention city last November. At that time, owing to heavy snows in the mountains and the warm, south Chinook wind, heavy floods carried away the dam of Cedar Lake, in the Cascade Mountains, and the wooden-stave pipe line lying in the river bed, that conveyed the water to Cedar Falls, three miles down the river. A plant which had cost the city $3,600,000, with $1,000,000 more authorized, was put clean out of service for six days as to water supply, and for some three weeks as to electric light and power. The city was without water, except for about two days' supply remaining in the city's reservoirs at the time of the break, and a small amount which was pumped from Lake Washington, within the city limits. Light and power during the interruption to the municipal plant was supplied for city lighting and to the customers of the municipal plant by the steam relays of The Seattle Electric Company, the water-power plants of the same company and the Seattle-Tacoma Power Company. Such an incident recalls the municipal water-power plant "accident" at Austin, Tex., some years ago, when the lake and system "went out," and suggests that such investments of public money in commercial enterprises are far from immune, although they are generally heralded as bringing in a social and economic millennium where nothing can possibly go wrong.

Isolated Plants

It stands to reason that, in many parts of the country, an isolated plant is still the only way in which the insistent demand for electric light and power can be met. But the increasing area covered by city circuits and the growing number of lines in suburban and rural regions are the means whereby the necessity for such isolated plants is being rapidly diminished. It must be so in the very order of things.

The subject was admirably discussed in a paper presented before the last annual meeting of the Pennsylvania Electric Association—a Section of the National Electric Light Association—by Mr. T. E. Spence. He showed that the question of cost is not always by any means the deciding factor in favor of purchasing energy from central stations, but that the many contingent, accruing advantages are largely in favor of the central station and must be given due consideration. In order to keep pace with the advancement of the art, a central station is forced to install modern apparatus, whereas the factory owner cannot readily afford to replace his apparatus with newer types and must usually use his plant continuously until it is relegated to the scrap heap. Moreover, the manufacturer never knows how future trade conditions will affect his business. The latter may increase extensively, and in order to keep pace with this growth it would be necessary to install additional units, which usually results in a very undesirable type of plant, needing more attention, more repairs, etc. On the other hand, if his business decreases, he will suffer loss by reason of fixed charges. Mr. Spence also asked if it is not better, from an investor's point of view, to avoid investment in a power plant which if destroyed will cause greater loss, due to interruption of business, than the loss due to the destruction of the plant itself, which latter can be covered by insurance. He stated that continuity and reliability of service should be given due consideration in balancing the central-station supply against the isolated plant; and, further, that whatever makes for continuity and reliability, at some sacrifice of economy and detail, may be installed and will ultimately prove of greater economy through the insurance of uninterrupted output. The central station is in business for the purpose of producing and marketing electrical energy. Its reputation for reliable service, consequently, must be safeguarded, and a complete shutdown is almost unknown. There is, moreover, sufficient reserve apparatus installed in the plant of a central station to permit one or more of its units to remain idle without crippling the service. Such is not the case in isolated plants. Mr. Spence gave a most convincing demonstration of the efficiency of the central-station idea in that his company supplies energy to coal mines and breakers from a coal-burning central station located several miles from the mines. The plants in the anthracite region can purchase fuel for about $1.30 per ton or less, and the energy can be purchased by the large mines for 2 cents per kw-hour or less. At such a rate the mine operators, especially those with smaller holdings, find operation with central-station service more advantageous than by isolated plant, with cheaper fuel but heavy investment cost per unit of work done.

In regard to isolated plants, the operations of the Union Electric Light and Power Company, of St. Louis, are peculiarly worthy of study. In several instances the Union Company has taken over isolated plants, operating these as auxiliary generating stations during the peak, and at other times only to give sufficient exhaust steam for heating purposes during the steam-heating season. Under such conditions the local generators are connected with its own Edison distributing network, so that any energy generated on account of steam heating in excess of the demand in the building is delivered to the outside lines. When no heating is required these plants are shut down and electric service is supplied from the Ashley Street central station. In other cases the company either converts the existing steam boilers into low-pressure units or installs its own steam-heating equipment, which is operated during the heating season. These decentralized heating plants also form, sometimes, the nuclei of localized steam-heating systems, the company often being able to go next door or within the same or adjoining blocks and replace other isolated electric plants, supplying winter steam from the boilers of the central isolated plant, while furnishing electrical energy from its main system.

To secure the power business of large industrial establishments the company has on its staff a number of sales engineers. A record is kept of all of the isolated-plant installations and calls are made on the owners of these stations to acquaint them with the advantages and economies of central-station service. Permission is requested for one of the company's engineers to go through the plant and study the cost of power production and distribution, with an idea of determining whether a saving would be made were such service furnished by the electric company. From the plant fireman and engineer information as to the expenditures for coal, oil and supplies is secured and estimates are made of the overhead costs, including interest and depreciation on the investment. Indicator cards are taken from the plant engines, and the sources of various losses in shafting, belting and other transmissions are located and investigated. After the test has been made on the plant, the solicitor usually makes several calls on the owner, ostensibly with the idea of asking for additional information, but at each visit lets drop some hint of a source of loss that has been discovered in the plant's operation. One or two of these suggestions usually make the owner keenly interested in the proposal which the central-station company has to offer, and the intelligent discussion of the company's representative begets further confidence in the mind of the owner. Discussion soon reveals the fact that the solicitor is perhaps better informed on methods of power application for his particular business than even the owner himself, and the company's complete report, submitted later, is awaited with great interest. These reports, prepared in a standard style, open with a description of the present equipment and an account of the tests made by the company's engineers on the prospective customer's plant, including an estimate of the present cost of operation. After this there follows in minute detail a description of the proposed installation of motors. In thus preparing for electric drive, in addition to the well-known advantages of better light, less power, etc., a point is made of the possible logical arrangement of the processes of manufacture, to require less handling of the product. Estimates of the size of motors, hours' use and operating costs with electric drive are then appended, a statement being made of the first cost of the new equipment, on which interest and depreciation are charged. The total operating cost under these conditions is then compared with the operating cost of the isolated plant. Sometimes it is even found possible to omit charging depreciation and interest on the steam plant, although including these on the motor drive, and still reveal a striking contrast between the two installations. The result is that almost invariably central-station supply "wins out."

NEW STATIONS AND PLANTS

General Conditions

Citations as to central-station technique have already been made from the review of the art by Mr. T. E. Murray. It may be noted that Dr. C. P. Steinmetz also made a luminous analysis of the course of evolution in central-station work at the annual meeting of the American Institute of Electrical Engineers last year. He asserted that, for reliability of service, the earlier direct-current stations have been unexcelled even to the present day, and attributed this to the following causes: The parallel operation of all the stations, which guarded the system in case of break-down of one or several stations; the storage-battery reserve, which maintained the service even in a complete shut-down of all the generating stations, and especially the nature of the system of low-tension feeders and mains, which limited the effect of any break-down at any point of the system to its immediate vicinity, by limiting the power which could be concentrated at any point to such an extent that no local break-down could seriously affect the entire system. He claimed that the modern polyphase generating stations correspond to the former direct-current generating stations, and the high-voltage feeders from the main stations to the substations, and the tie-lines between the stations correspond to the 2200-volt feeders and tie-lines between the earlier stations.

Dr. Steinmetz expressed the opinion that, on account of the increase in the loss of economy and reliability, and the complication of control of a system with the increasing number of separate stations, the only feasible method which permits unlimited extension of the system, without any increase of danger and complication, is the parallel operation of the entire system on a single ring bus, which is divided into sections by power-limiting bus-bar reactances. The limitation of power by the reactances in bus-bars and generators appears sufficiently safe, but it has the disadvantage of exposing the bus-bar section and the feeder switches momentarily to the shock of short-circuit in case of the failure of a feeder. It is probable, therefore, that a safer way of operation would result from limiting the power of the feeders by reactances and maintaining service on each feeder in case of a fault until the fault either clears itself or the feeder has to be cut off. That is to say, it seems desirable in the modern high-output, high-voltage station to return to the well-tried principle of the low-tension, direct-current system.

The parallel operation of synchronous machines requires reactance in the circuit between the machines. It is necessary, however, that the combined impedance of the resistance and reactance of the cross-circuit should be sufficiently low to allow a large enough current to be produced to keep the machines together against any tendency to separate them, such as inequality of the driving power, slightly different speed, adjustment of the engine governors, etc. With greatly increased reactance in the circuit it would be necessary to control the speed of the prime movers independently of the alternators, so as to be so closely the same under all conditions as to require a very small synchronizing power between the alternators to pull them into step. That is to say, the prime movers must be synchronized. Although this problem has not yet been solved, its solution presents no difficulty, because the governors can be controlled electrically with the required amount of ease. The governor in the steam supply system would be controlled by the rate of exchange of energy between the stations, in combination with sufficiently powerful dashpots to guard against the hunting of the governors.

In the interesting discussion which followed, Dr. Steinmetz, referring to the oil circuit-breaker, remarked that it is based on the control of explosive forces developed by enormous power at the break. He spoke hopefully of the induction generator. This machine has advantages with respect to short-circuit currents, but there are serious difficulties in the way of introducing it into practise, and, moreover, it does not solve the momentary short-circuit problem. As to the external and internal reactance for generators, he said that the problem is essentially similar to that which nearly thirty years ago was confronted in the early Edison low-tension station. It was then solved, and, although it cannot now be attacked in the same manner as then, it is nevertheless being solved just as surely.

Huge Turbo-Generators

The year 1911 saw another record made in the installation last November of the first of three 20,000-kw turbo-generator sets in the No. 1 Waterside Station of the New York Edison Company. These generators are of the 4-pole, 3-phase, 25-cycle type, wound for 6600 volts. The normal speed is 750 r.p.m. They are direct-connected to 6-stage Curtiss turbines, designed to operate on 175-lb. gauge pressure, with a back pressure of 1½ lb. absolute in the exhaust chamber, and with steam superheated to 100 degrees Fahr. The steam consumption in pounds per kw-hour under these conditions is guaranteed to be as follows:

Load in Kilowatts	Steam Pounds per Kw-Hour	Total Steam per Hour Pounds
10,000	15	150,000
15,000	14.4	216,000
20,000	15	300,000

The dimensions of the base of the machine are 17 ft. 6 in. by 17 ft. The height above the base is 35 ft. 7 in., and the height of the foundation above the basement floor is 10 ft. Each machine weighs, approximately, 420 tons, the revolving parts weighing 112 tons. The runners are 13 ft. in diameter, and the total number of steam buckets they contain is 7200. It is interesting to note that the area occupied by one of the 20,000-kw units is 297 sq. ft. The area occupied by the single 3500-kw engine-generator unit of the type displaced is 918 sq. ft., so that the unit generates, approximately, eighteen times as much power as the old reciprocating engine per unit of area occupied.

Assuming that the turbine is fully loaded all day and that there is an evaporation of 9 lb. of water per 1 lb. of coal, the unit will require 7,200,000 lb. of steam a day, and about 400 tons of coal. This unit has more than sufficient capacity to supply Delaware with the electric service at present furnished by the various public-utility companies in that State.

Most notable of all under this head is the order just placed by the Commonwealth Edison Company, Chicago, with Charles A. Parsons and Company, of Newcastle-on-Tyne, England, for a 25,000-kw turbo-generator for its Fisk Street station. The maximum rating of the machine will be approximately 40,000 hp. It is understood, unofficially, that the turbine will be a horizontal machine, the low-pressure end being of the double-flow type. The turbine is to be of the pure Parsons design, which is not made in this country, but will embody many ideas and details due to the well-known consulting engineer, Mr. Frederick Sargent, who has arrived at steam economies heretofore unknown and unattained. The generating unit will be 75 ft. long and 18 ft. wide, and ultimately three more will be installed in the enlarged Fisk Street station, which will then have a rating of 220,000 kw. The speed of the new unit is to be 750 r.p.m. The generator will be 25-cycle, 3-phase, 4500 volts, with the exciter on the shaft. The arrangement of the condenser is entirely new. The auxiliaries are to be of the rotary type and electrically driven. It is said that the new generator units will take no greater floor space than vertical units of equal rating. By an ingenious rearrangement of boilers and economizers, no greater ground area will be required for additional steam-raising equipment, although extension of coal-handling machinery will be needed. The full data as to this enormous unit will be awaited with keenest interest. The unit now under contract is to be shipped before the end of this year. The Fisk Street station supplies about one-third of the energy for the elevated lines and practically all of the energy for the surface lines of Chicago.

Large Boiler Units

Several years ago this Report referred to the big Delray plant of the Detroit Edison Company, with its many novel features of interest. One of the most recent and remarkable of these is the pioneer use at Delray of huge water-tube boilers, any one of which is capable of supplying for short periods steam turbine loads up to 11,000 kw. Each of these great steaming units is rated at 2365 boiler hp, on the assumed basis of 10 sq. ft. of heating surface per hp, or 30 lb. of steam per hp-hour. The Delray boilers have been tested up to 214 per cent of full load, which is equivalent to generating steam at about 7 lb. per hour per square foot—not an excessive evaporation for boilers in modern practise. Ordinarily the Delray units, of which there are five erected and five more now being installed, carry 6000 kw to 7000 kw each. This load increases to 8000 kw per boiler during the peak periods, and for short durations has reached 11,000 kw. Each boiler is 36 ft. high, 30 ft. wide and 28 ft. deep, being fired from both ends. The three huge steam drums are connected with the two mud drums by no less than 1564 3¼-in. tubes. Each boiler has four water-columns and an even dozen safety valves designed to relieve pressure rises above the normal steam condition of 205 lb. pressure and 150 deg. superheat. At normal rating, the big units have shown a combined thermal efficiency of 80 per cent (about 89 per cent being the maximum possible value), and this observed efficiency decreased only to 76 per cent at 100 per cent overload. It is held that the remarkable economies obtained can hardly be traced to exceptional flue temperatures or any other furnace conditions differing materially from ordinary experience. But the big units decrease the usual proportion of radiation losses, and, with their single huge fires, enable the closest attention to be given to but the one bed. Labor costs are thus reduced correspondingly, and the boiler-room lay-out is simplified and cheapened. The boilers themselves cost less per unit of rating than similar small units.

Difficulties with furnace brickwork in the big boilers have apparently been solved as rapidly as they presented themselves.

Recently a series of tests on two of the 2365-hp Delray units was carried out under the direction of Dr. D. S. Jacobus, and these tests formed the subject of a paper presented by him December 6 at the annual meeting of the American Society of Mechanical Engineers. One boiler equipped with Roney stokers and one with Taylor stokers were studied, the test requiring the services of fifty men working in eight-hour shifts for six weeks. During this time 5000 tons of coal and 45,000 tons of water were measured. The results obtained from Dr. Jacobus' tests show that with both classes of stokers the combined efficiency of both boiler and furnace ranges from 80 per cent at slightly below nominal rating to about 76 per cent at double rating. The turbines driving the blowers for the Taylor stokers exhaust back into the feed-water heaters, the steam used for this purpose (which is reclaimed) amounting to 2½ to 3 per cent. The Roney stokers require about 1½ per cent of the total steam generated by the boilers, and, except for about one-fifth of 1 per cent, which is similarly reclaimable from the stoker engine, the remainder is used in the form of jets under the grates and is therefore lost in the chimney products. Each row of two or three large boilers is provided with a steel stack, 18 ft. in diameter and 250 ft. above the grates, these stacks being lined with common brick backed by concrete.

Discussing the subject of steam plant efficiency, the *Electrical World* in its review of the year 1911 remarked: "It is still true, as perhaps it always will be, that in the steam-driven power plant the part susceptible of the greatest improvement in economy is the boiler-room. Careful tests during the year, as well as previously, show that under the best conditions a boiler economy of 83 per cent may be realized. It is not probable that in power plants the country over values better than from 75 to 78 per cent are maintained. The demonstration of a top-notch value by some one plant is a fine achievement as pointing the way, but it is of vastly greater import to endeavor to raise the average up toward some such attainable maximum. Increasing attention seems to be given to flue gas analysis and to CO_2 recorders, and to the intelligent interpretation of their results, to methods for controlling and regulating air supply, to methods of securing as nearly as may be a definite program of operation for the boilers which shall insure periodic and systematic overhaul and cleaning at not too long intervals, to means for absorbing the heat in the escaping flue gases down to the minimum temperature, and, in general, to the many factors on which boiler economy depends. These all merit continued and earnest study, and every power-plant engineer should set before himself as a goal the progressive elevation of his boiler economy step by step until it represents the maximum practically attainable under his conditions of operation. The two most interesting events of the year in connection with the boiler are the installation of the huge units in Detroit and the work of Professor Bone, of Leeds University, England, in connection with the combustion of gases and vapors at lower temperatures than those prevailing in the usual form of so-called explosive combustion. Professor Bone takes advantage of the basic fact that various combustible gases may combine slowly into oxygen at a temperature slightly below that necessary for the more rapid combination known as normal combustion, and that this rate of combination can be greatly accelerated by the presence of porous substances such as porcelain or firebrick. The result attained by the development and application of these facts is, in brief, the combustion in a boiler tube filled with broken firebrick of a gaseous fuel mixed with air, burning without flame or noise, and resulting in the evaporation of about 21 lb. of water per square foot of heating surface, and with a thermal efficiency of about 93 per cent. This is an evaporation from six to seven times the normal rate of output, and at an increase of some 20 per cent in efficiency over the values for normal boiler practise. It is too soon to appraise these results properly as to their possible effect on the future of the steam boiler, but they appear to be of the deepest significance, and the engineering world will await with eagerness the results of further study regarding the practical application of these principles."

Under-Water Coal Storage

The adoption of under-water coal-storage methods is a subject that has often attracted the attention of the central-station manager. Coal in dry storage even six months may lose as much as 25 per cent of its fuel value, while its tendency to spontaneous firing is an additional source of trouble. For these reasons, unfortunately, it does not pay to keep large quantities of fuel continually in stock to guard against possibility of strike shortage, while, on the other hand, the matter of acquiring a large coal reserve quickly becomes a problem after the first rumors of a strike are abroad. Recent conditions in England need no comment. Coal can be stored under water, however, almost indefinitely without loss of its fuel value. This has been proved by tests, and such under-water storage offers an opportunity for holding large coal reserves almost indefinitely against a time of need. With this idea of guarding against strike shortage, following a recent expensive experience, the Omaha Electric Light and Power Company has built a great under-water storage pit capable of holding 10,000 tons, with the bunker contents enough for three months' operation of its 13,000-kw plant.

This submerged storage pit measures 100 ft. by 116 ft. in plan and is 22 ft. deep below the water level, which is in turn 23 ft. below the crane runway. It will submerge 7000 tons of coal, while 3000 tons more can be piled on above the water level. The coal is unloaded from cars run alongside the pit by means of a grab bucket carried on a crane of 145-ft. span. The coal-car track passes directly above the hoppers leading to the coal crushers, which in turn discharge into the conveyors, elevating the fuel to the overhead bunkers. This arrangement provides that the ordinary route of the fuel is from the cars to the boiler-room, the storage pit always being kept filled with a fixed quantity of coal.

The storage pit is of reinforced concrete and is carried on nearly 400 piles at 5-ft. centers driven to bed rock 19 ft. to 30 ft. below the semi-liquid quicksand. The presence of this quicksand made it necessary to reinforce the structure for both internal and external pressures to prevent collapse of the pit when empty. The piles are capped with 2-ft. 6-in. concrete slabs, reducing the stresses in the pit floor, which is 12 in. thick.

Besides the steel reinforcing in the floor, old rails have been embedded in the concrete at 1-ft. distances, their heads being flush with the waterproofed floor surface, to serve as an armor against the impact of the bucket when removing coal from the pit. The side walls are 4 ft. thick at the bottom, tapering to

2 ft. 6 in. at the top. The submerged storage has been so constructed as to be capable of extension in both directions as the plant grows. Spanning the pit and the crusher hoppers, a total width of 145 ft., is a 5-ton bucket crane. This crane is made up of two girders 12 ft. apart, between which runs the trolley carriage with its 2-cu. yd. bucket. The bridge is propelled by a 45-hp motor at 300 ft. per minute, and the trolley is operated at a similar speed by a 16-hp motor. The main hoisting is performed by two motors, one of 45 hp and the other of 30-hp rating, giving a hoisting speed of 120 ft. per minute. With this crane bucket a 50-ton car has been unloaded in twenty minutes. The cost of each handling of the coal is estimated to be about 4 mills per ton, whether from car to pit or pit to crusher hoppers.

On account of the muddy sediment of the Missouri River, on the banks of which the plant stands, waste water from the plant supply (which has been allowed to settle in sedimentation basins) is used to fill the coal-storage pit. For draining the pit, outlets fitted with valves are provided just above the sewer level, so that the water can be drained down to this point by gravity, beyond which the same sump pump used to fill the pit can be brought into service for the purpose of discharging its contents into the sewer. This Omaha under-water coal-storage pit is estimated to have cost about $70,000, a part of this being due to the unusual and difficult conditions of quicksand on which the pit had to be foundationed.

Use of Lignite Producer Gas

The utilization of low-grade fuels may not press very heavily yet on central-station consciousness, but is likely to become more and more a subject of serious consideration. One of the fuels thus to employ is lignite, of which vast beds occur in the Southwest, and it has been utilized both in gas-producers and under steam boilers, with varying success, as noted last year. The chief objection urged against lignite as a fuel material is the varying moisture which successive shipments from the same mine may carry. This lack of uniformity results in inequalities in the gas given off and in other difficulties in producer operation. Trouble is also reported from producer plants required to meet rapid changes of load. The response of the producer to an increased demand for gas production if the load rises suddenly is generally quite sluggish, and the engine may go dead from insufficient fuel supply. As most of the producers installed have been of the suction type, it seems out of the question to attempt to provide fuel-gas reservoir or storage capacity to meet sudden changes in load. This characteristic of the lignite producer to balk under irregular load-curve conditions hardly adapts the producer engine to applications where its low fuel cost and other advantages would otherwise make it very useful.

In discussing the lignite producer before the Southwestern Electrical Association convention last year, Mr. W. B. Head, general manager of the Stephenville (Tex.) Light and Water Company, recounted his own highly satisfactory experience during four years' operation, twenty-four hours daily, of a 100-hp up-draft producer plant doing both electric lighting and water pumping. The performance of this equipment he characterized as unqualifiedly successful, whatever troubles were met with having been of a purely mechanical nature, such as might occur with any internal-combustion engine. The Stephenville plant is run continuously twenty-four hours per day, except Sundays, when it is shut down twelve hours for overhauling. The cost of fuel at 80 per cent load-factor has averaged under 5 mills per kw-hour. Mr. Head pointed out that, unlike steam plants of equivalent sizes, producer plants of even very small ratings share the high efficiencies and the economies of the larger sizes. While there are some cases where he would not recommend lignite producer-plant installations, as for electric-railway work, yet in general he referred to the lignite producer as the coming form of power in the Texas district, and he declared that a dollar's worth of lignite contains more available potential energy than any other form of fuel.

The Blooming Grove (Tex.) Ice and Electric Company has had a 60-hp lignite producer-engine plant in operation during the last three years. The early experiences were quite disappointing, and for a time the plant was virtually a failure, minor misadjustments or broken parts, the causes of which were often apparently undiscoverable, resulting in refusals to start or run. About this time the plant ownership changed, and with it men of good mechanical experience, though new to producer-plant operation, were placed in charge of the equipment. For a time the difficulties with the plant continued, but persistency in application soon mastered the details of successful producer operation, and last year this lignite plant was reported as working to the entire satisfaction of its owners and operators.

Blooming Grove is a town of about 1000 population, a few miles west of Corsicana. Night electric lighting service for 100 customers and the town water supply are furnished by the producer engine, the waterworks pumps being run during the night hours after the evening peak has been passed. The plant equipment comprises a 60-hp gas producer, providing fuel gas for a vertical, double 12-in. by 13-in. cylinder engine running at 290 r.p.m. A 35-kw, 2200-volt, 60-cycle, single-phase Allis-Chalmers alternator is belted to the engine fly-wheel, and from clutch-driven extensions of the engine shaft the air-lift compressor and high-duty water pumps are driven. Lignite from the Beargrass (Tex.) field has been used in the producer. This fuel costs about $1.00 a ton at the mine and $2.10 a ton laid down at the plant when contracted for in quantities. For this has been substituted Malacoff lignite from a nearer and newly developed field, costing $1.40 per ton laid down. The plant requires about 1500 lb. of lignite per twelve to fourteen-hour night's run, and about twenty carloads are used per year. During four to five months of the summer the plant is run twenty-four hours per day for supplying fan service during the daytime.

Natural Gas Central Stations

There are various natural gas central stations in different parts of the country, but it is more particularly, perhaps, in the Southwest that one expects to find them. A successful small station of the kind is that of the Independence Electric Company, at Independence, Kan., a 775-kw plant which contains three different types of gas engines and includes several ideas of novelty in its arrangement of exhaust and cooling tower for the jacket and piston circulating water. In other respects as well, besides its internal-combustion engine operation, is the Independence central-station situation of noteworthy interest among similar towns of 12,000 population. In spite of cheap natural gas, a number of the local industries are operated from the lines of the electric company, whose connected load in motors is larger than its evening lighting peak. Most notable of all is the number of electric pleasure vehicles in use in Independence, where nearly forty cars provide a desirable off-peak charging load for the plant.

Under the average operating conditions of the Independence plant during a thirty-day test, including periods of light as well as full loading, a kw-hour was produced for every 20 cu. ft. of gas taken by the engines. This natural gas, which comes from the Oklahoma fields, has a fuel value of about 950 lb. Fahr. heat units per cubic foot. Under conditions of ½ to 60 per cent load at the time of another test, the engine produced an hp-hour on 11.75 cu. ft. of gas.

Oil-Burning Plants

Some figures have recently been published as to the oil-burning plant of the Citizens Electric Light and Power Company, of Lebanon, Ind., one of the few central stations in the Middle Western States equipped with self-igniting oil engines of the Diesel type. These units have now been in service more than six years. The principal equipment of the station comprises two 225-hp, 164-r.p.m., 3-cylinder American Diesel engines, direct-connected to 160-kva, 2300-volt, 60-cycle, 3-phase alternators, and a 125-hp, 83-kva, 225-r.p.m. unit of similar type. The last of the larger units was installed in 1907, the other two engines having been in service since 1905. Each set is arranged with its own belt-driven exciter, and one engine can also be belted to an air compressor in the main engine-room; but the compressed air for the plant is principally supplied by two motor-driven compressors in an adjoining room. At the rear of the plant building is the cooling tower for reducing the temperature of the engine-jacket water.

The fuel used in the engines is a partly refined heavy oil, testing 30 degrees Baumé and containing about 19,000 lb. Fahr. heat units per pound. From it the sulphur and other objectionable materials have been removed. This oil costs 2.75 cents per gallon delivered in tank cars to the 11,000-gal. underground storage container, 30 ft. south of the plant. The engines derive their immediate fuel supply from two 30-gal. steel tanks within the station, into which the oil is pumped by hand from the underground reservoir once every hour. Each time the levels in the tanks are thus restored to their normal heights, record is made, on a blank form kept for the purpose, of the quantity pumped in, so that the figures thus obtained represent the hourly fuel-oil consumption of the engines. The quantities of oil fed to the engines are exceedingly small, averaging less than half a thimbleful per cylinder per stroke in the case of the 225-hp units. Under ordinary conditions the engines consume from 10 gal. to 20 gal. of oil per hour, and produce 10 kw-hours per gallon of oil.

The cost of producing a kilowatt-hour in the Lebanon plant has averaged 2.8 mills for fuel oil alone and 1.9 mills for labor. Three men are employed about the station, but one of them gives only half of his time to the operation of the plant, having also charge of making arc-lamp renewals, overhead repairs, etc. Lubricating oil and waste have averaged 0.2 mill per kilowatt-hour. The item of repairs on this plant has been rather heavy, although difficult to ascertain with accuracy. During four years prior to the time the present management took charge, the renewal parts included fifteen cylinder heads, one crank-shaft and two cylinders. This high fatality among the cylinder heads was afterward traced to the lack of adequate cooling by the circulating water. Thermometers have now been placed on all outlets, and these readings are carefully noted at frequent intervals, so that the temperature of no outlet water at any time rises beyond 120 degrees Fahr. Such a minor injury as a cracked cylinder does not necessarily impair the operation of an engine. One of the units has been running with a very small crack in the cylinder for several months, with no other evidence of its deficiency than a slight noise and a cloud of steam in the exhaust at each discharge from this cylinder. At all other times the exhaust gases are quite invisible, except when starting on very rich charges. During the time that the plant has been in the hands of its present management the repair items have been slight, as the result of the careful attention given the discharge water.

The plant enjoys an excellent load-factor, its total output averaging about 41 per cent of the twenty-four-hour equivalent of its maximum demand. During the eight hours of the working day its load due to motors averages 78 per cent of its evening peak. Among the profitable motor services supplied by this station are the city waterworks pumping plant, whose 60-hp load occurs eighteen hours daily during off-peak periods; a 25-hp planing mill, a 50-hp flour mill and 60 hp in motors in a cream separator factory. There is a total of 518 hp connected in 3-phase motors. The rate for this motor service varies from 5 cents to 2½ cents per kw-hour, according to the quantity that the consumer may use. The company had, at the end of last year, secured no fewer customers than 750 in a population of 5500, with net rates of 10 cents for residence lighting and 8 cents for commercial.

Testing the Coal Supplied

With an increasing number of our member companies using coal as fuel, the coal is subjected to test; and with a lower price each year for the kilowatt-hour delivered, this practise becomes increasingly important and necessary. The details as to the method of one plant may be cited. The Birmingham (Ala.) Railway, Light and Power Company purchases its coal under a contract with the mine by which payment is made entirely on the basis of the quality of the fuel furnished as shown by chemical test. These tests, which are made on a 100-lb. sample taken from each shipment, include a determination of the heat-unit fuel value of the coal and the quantities of sulphur, moisture and ash material present. According to the six-year contract, the company agrees to pay $1.55 per ton for the coal, on a basis of 13,000-lb. Fahrenheit units per pound. For all deviations shown by the test results from this 13,000 heat-unit standard, the coal company is paid proportionately, receiving a premium when the fuel content runs above the base value and sustaining a proportionate reduction when it falls below 13,000 heat units. Further premiums and deductions are granted the dealer with regard to the ash content of the fuel as follows: 7 to 8 per cent ash, 9 cents per ton premium; 8 to 9 per cent ash, 6 cents per ton premium; 9 to 10 per cent ash, 3 cents per ton premium; 10 to 12 per cent ash, no correction; 12 to 13 per cent ash, 3 cents per ton deduction; 13 to 14 per cent ash, 6 cents per ton deduction; 14 to 15 per cent ash, 9 cents per ton deduction; 15 to 16 per cent ash, 12 cents per ton deduction; 16 to 17 per cent ash, 15 cents per ton deduction; 17 to 18 per cent ash, 18 cents per ton deduction; 18 to 20 per cent ash, coal rejected.

Part of the sample is also subjected to a drying temperature and its loss in weight noted as the moisture is driven out. Three per cent moisture content by weight is allowed; but for all water present above this amount, proportionate correction is made in the car-load weights of the coal. As long as the sulphur content of the coal remains below 1 per cent no deduction is made for the presence of this material, but for sulphur in excess of this amount penalties as follows are subtracted from the purchase price of the coal per ton: 1 to 1¼ per cent sulphur, 5 cents; 1¼ to 1½ per cent sulphur, 10 cents; 1½ to 1¾ per cent sulphur, 15 cents; 1¾ to 2 per cent sulphur, 20 cents; above 2 per cent sulphur, coal rejected.

The contract stipulates the delivery of the coal in drop-bottom cars, and provides for a deduction of 5 cents per ton from the price of all coal not delivered in such cars. In case the specifications for the thermal units, ash, sulphur or moisture in the coal are continually infracted to a degree that may be deemed injurious to the plant equipment, the company reserves the right to cancel the entire contract. The price of the coal contracted for is based upon a certain wage payment to the miners, and if, during the life of the contract, this wage scale is raised, the electric company agrees to pay the coal company proportionately. The Birmingham company is now burning from 300 to 500 tons of coal a day at its main generating station, from which the local lighting, power and street-railway services are supplied. The scheme insures that the electric company gets the best output of the mine. The mine is paid at a higher rate for this superior product, and the electric company profits by its better combustive properties. The analytical-test results of the 100-lb. samples from each shipment, which include both lumps and fine coal, are prepared in triplicate, one copy being retained by the chemist, one going to the superintendent's office, and the third being sent to the coal company, providing it with the data from which its bill is prepared. When desired, a chemist representing the coal company checks the work done by the electric company's analyst. In case of dispute, it is provided that the issue be submitted to an impartial laboratory for retest of a sample from the same shipment.

GENERAL QUESTIONS OF ILLUMINATION

The business of a modern central station is so varied to-day that managers have long ceased to fix their attention on lighting only; but the fact remains that, to the public, the main occupation of the industry still appears to be that of furnishing illumination for the street, the office, the store, the factory and the home. For the manager himself, the problems of illumination will ever possess deep interest, no matter what other branches of the industry may press upon his attention and time. This is true not only where a small station depends mainly or exclusively on its night load, but where the availability of new illuminants brings with it in large cities many deep problems in the relations between generating plant, price of electrical energy, lamp renewals, higher standards of illumination required, and a whole series of intricate readjustments that reach far beyond engineering in their final effect.

Street Illumination in Europe

Some data have already been given above as to illumination in the streets of three of the capitals of Europe. Statistics do not, however, exhaust the subject. Last October, in an address before the Illuminating Engineering Society in Chicago, Dr. Herbert E. Ives remarked that in modern Europe the street lighting is fairly good, but interior illumination is very poor, as a rule. He saw only one example of modern illuminating glassware on the Continent. Europe may be the home of art, but there is more truly artistic lighting in this country than abroad, although that isn't saying much. In Venice the canals introduce an interesting problem in street lighting by reflections from the water; it is, in fact, as if the streets had mirrors for pavements; the lights are seen double. As to high lamp-posts, he noted one place in Berlin where iron posts as high as 50 ft. had been used for flaming arcs with good effect. The lamps were above the ordinary range of vision, and the illumination was spread over a large area. Dr. Ives considered that in the scientific development of new illuminants Germany is in the lead, but that, once they are developed, the Germans do not make use of these illuminants intelligently. There are more high candle-power arcs in use there than in the average American city. The Germans do not use their new lamps either artistically or comfortably. They are far behind Americans in the use of reflectors and diffusing mediums for the reduction of annoying glare. Scientific reflectors are rarely seen in Europe by the casual observer.

At a meeting at Association Island last September, Mr. Henry L. Doherty, concededly a shrewd observer, with large interests, remarked in regard to a recent trip to Europe that he had observed the flaming arc in use there to a considerable extent for street lighting, with results that would not be considered satisfactory in America. From the view-point of appearance it was offensive, and its use was detrimental to the central station in that, after all, it tended toward a low degree of illumination. Mr. Doherty held that the methods now prevalent in America, especially in the introduction of tungsten street lighting, would lead to increased success in public illumination.

In a most interesting recent article on arc lighting, Dr. C. P. Steinmetz has remarked: "The relatively large areas covered by American cities, and the practise of using the same class of illuminant for the suburbs as for the centers of the cities, requires an arc illumination of a far greater mileage of streets per thousand population than is the case, for instance, in European cities; and the use of high-intensity lighting units, such as high-power flame lamps, in this case would make the cost of street illumination prohibitive except under special conditions, as in large, densely populated cities. With the low intensity of street illumination required by the large mileage of streets of American cities, white light is required to give a reasonable apparent brightness, while the yellow light would appear dull and inferior. This makes the yellow flame lamp inferior to the luminous arc for general street lighting, even if a sufficiently small-power flame lamp unit existed."

New Arc Lamps

One of the important developments of the past year was the introduction of enclosed flame arcs with impregnated carbons capable of operating for about 100 hours on one trim; and with an estimated cost, as compared with open-flame arcs, for trimming carbons, etc., of $10.46 instead of $45.01. The carbons are arranged vertically co-axially instead of converging, and the various materials in the electrodes are mixed up homogeneously and the electrodes squirted in one piece. Best results are secured on 25 cycles at 7.5 amp., with 65 to 70 volts at the arc. The lamps are made to burn economically on both alternating and direct current. The carbons are supplied to give either a white or a yellow light, and the stub of the upper electrode can be used as the new lower.

Another new form of arc lamp was that introduced at the close of the year in New Haven, Conn., when the "White Way," comprising two of the principal business streets, was dedicated with most impressive ceremonies, and a slogan sign, "Old Elms but New Ideas," was appropriately flashed upon the gaze of the 100,000 enthusiastic celebrants. A "boulevard" luminous arc was then put in service for the first time, with 78 "inverted" 6.6-amp. lamps, on 11.5-ft. posts, spaced at intervals averaging 87 ft., and staggered on opposite sides of the two streets. By "inverted" is meant that the globe of the lamp is placed above the mechanism instead of below it, as usual. The effect of the illumination is most pleasing and satisfactory, and the installation seems to mark the point of a new departure in an effective response of the modern arc on low posts to the ornamental street lighting with tungstens that has threatened the old supremacy of the arc outdoors. The minimum illumination is placed at about 2 foot-candles, which is quite high by street-lighting standards.

Chicago and Philadelphia

It should be noted that the municipal plant authorities of Chicago are planning to adopt no fewer than 15,000 flaming arcs for the streets of that city, of which 4000 are a first installation. There will be nothing like it in the world, and the results will surely be studied with intense interest. One of the difficulties with the long-burning flame arc hitherto has been its relative unsteadiness, and this may become a very serious problem with so large an equipment; while, on the other hand, it would hardly be wise to attempt such work with lamps of frequent trim. The street arc lighting of Chicago to-day from the municipal plant is dismally unsatisfactory and utterly unworthy so great and progressive a city.

One of the best-lighted cities in America is Philadelphia, which, with wonted conservatism, has stuck to its open arcs and has of late made great advances with that type of equipment. Up to January, 1910, the city was lighted by some 12,000 constant-current 9.6 amp. open arcs. In the central district, these were about 200 ft. apart, and in the suburban districts 400 to 500 ft., with energy derived from Brush 125-lighters. A new system with ornamental twin posts has now been installed over a large part of the territory, supplemented in one district by lamps suspended between the columns of the elevated railway structure. The ornamental steel twin post is of T pattern, with the lamp globes 18 ft. above the sidewalk, with a slight change in the design of the lamp case to harmonize with the lines of the post. The lamps are of the broad-carbon open-arc type, with a 3 × 5 × 5/8 in. upper electrode and a 3 × 5 × 5-16 in. lower. The lamps consume 480 watts and are trimmed every 30 hours. In the heart of the city, the twin posts are located on the Market Street curb lines at all intersecting streets. The distance between corner lamps was divided into thirds, at which points the intermediate lamps are placed. Hence each block in the shopping district has four posts, or eight lamps, on each side of the street. Elsewhere the posts are staggered instead of being placed opposite each other, so that each block has half that number of lamps. There are also several twin post "isles of safety" in the center of the roadways. It is obvious that the replacement of three 480-watt lamps by sixteen of the same consumption on Market Street east of City Hall, and by eight on the other thoroughfares, has given a splendid enhancement of illumination in all these districts, so that the "good old open-arc" is still very distinctly "in it" from any point of consideration.

A Referendum in Rochester

Having the question up of a new street lighting franchise, the Rochester (N. Y.) Railway and Light Company, which has a most winning way of taking the public into its confidence, put up last fall on two busy adjoining blocks an installation of 6.6-amp. magnetite lamps, while on another block, immediately adjoining, the company put up a rival equipment of ornamental posts, each fitted with five tungsten lamps. Thus the public and the various civic and commercial associations could judge for themselves, by the eye at any rate, the actual illumination and its effectiveness in each case. The magnetite arcs were erected in pairs on an ornamental extension of the company's trolley poles, high above the sidewalk, with a double "bishop's crook" effect. The lamps are thus well out of the line of vision. The tungsten posts, on the other hand, are spaced very close together, along the sidewalks. At night the magnetite block is brilliantly illuminated, whereas the block with the tungsten lamps presents a very subdued lighting effect, with an entire absence of high lights. During the daytime the slender and higher poles on which the magnetite-arc lamps are suspended are scarcely noticeable, whereas the tungsten posts, with their white diffusing globes, present the appearance of a picket fence when viewed at a certain angle. It is an interesting competition.

The Problem of Arc "Substitution"

In many places and in more ways than one, the question that Aladdin dealt with so long ago of changing old lamps for new, has cropped up again to puzzle and perplex city councils and central-station managers. A typical instance dealt with by the Wisconsin Commission is that of the joint request of the Waupaca Light and Railway Company and the city of Waupaca that the Commission should act as arbitrator and investigate and adjust certain questions relating to street lighting in the city of Waupaca. From 1886 to 1904 the company supplied the 9.6-amp. open direct-current arc lamps for street lighting, under a contract which called for lamps of 2000 nominal candle-power. In the year 1904 the old open arc was abandoned and the 6.6-amp. inclosed alternating-current arc substituted. Although the contract still specified a lamp of 2000 nominal candle-power, no objection to the substitution was raised by the city until early in 1910, when the city refused to pay the lighting bills on the ground that the inclosed arc was not a fair substitute for the open arc under the terms of the contract. In March, 1910, the company increased the current in its arc circuit from 6.6 amp. to 7 amp., where is has since remained. The main point which the commission was called upon to decide was whether the substitution was a fair one, and, if not, what damage, if any, the city had sustained because of such substitution previous to March, 1910; also what adjustment of differences after March, 1910, would be fair to both parties.

The commission has held that, in so far as intensity of illumination alone was considered, the 6.6-amp. inclosed alternating-current arc was inferior to the 7.5-amp. alternating-current arc by from 18 to 20 per cent, and that the 7-amp. arc was inferior by about 10 per cent. The commission was of the opinion that the comparison of radiants by ratios of illumination produced at a certain distance from the lamp is hardly sufficient as a measure of the relative merits of the radiants. In an effort to reach some reasonable basis for comparison of the intangible qualities of the various types of arc lamps, the commission engineering department carried out a series of tests and observations, the results of which, while not admitting of exact mathematical expression, led to the conclusion that the inclosed alternating-current arc lamp made up practically for its lack of intrinsic brilliancy by its steadiness, better light distribution and the general satisfaction that it gave.

The Commission held that the 7-amp. inclosed alternating-current arc was so near the equivalent of the 9.6-amp. open direct-current arc that the difference, if any, was too small to be measured by any monetary standard. In this connection it was pointed out that the analysis of the costs of service in the street-lighting department showed that, even with the decreased cost occasioned by the substitution of the new lamps, the revenues were insufficient to provide a reasonable return upon the investment properly apportioned to street lighting.

Fortunately, the Association now has a street-lighting committee under the able guidance of Mr. John W. Lieb, Jr., to consider and advise upon the questions that press for determination in this important field.

Tungsten Street Lighting at Warren, Ohio

There are many "modern instances" of ornamental tungsten street lighting, but Warren, Ohio, may well serve for citation. Up to about two or three years ago, the city had open arcs and then considered changing to enclosed, but the local company intervened with some suggestions and demonstrations as to tungsten posts, and finally the new contract was made for series tungstens on a 10-year basis, the company to install and operate the entire system. It seems only natural that a great incandescent lamp manufacturing center should thus use its own product. The installation is divided into the residential and the downtown systems. In the former there are 355, 90 and 175 street series lamps of 40, 60 and 80-cp, respectively. All the units are equipped with radio reflectors and are suspended by gooseneck brackets from wooden poles arranged in a straight line along one side of each residential street. In the spacing of these units, one lamp is located at each street intersection, and the intervening distance between corner lamps is divided so that the spacing is as uniform as possible. This varies, however, from 100 to 300 ft. in the different streets, depending on the traffic demands and to some extent on the foliage of the shade trees. The height of the lamps above the pavement is 14 ft., and they are suspended 3 ft. beyond the curb-line over the road. The illumination in the residential districts is highly satisfactory and is far superior to that furnished by the former open arcs.

The lighting of the downtown streets is quite ornamental. Sixty-two 3-lamp iron standards supporting two pendent lamps and one upright are employed on the principal business streets, while around the central park twenty-two single-lamp standards are located. At the entrance of the courthouse, on the north side of the park, two 5-lamp standards are situated, one on either side of the approach. All upright lamps are rated at 80-cp, except nineteen 60-cp lamps on the single-lamp standards, and are surrounded by 14-in. globes, while 12-in. globes are used on the 40-cp pendent lamps. The spacing of the 3-lamp standards is uniform in each street, but varies from 65 to 75 ft. in different streets; that of the single-lamp standards is from 65 to 85 ft. The corner standards at street intersections are set where the street lines extended meet the curb line; thus there are eight of these standards at each intersection.

The ornamental standards are anchored to a 2½-ft. cube of concrete, the center of which is placed 18 in. back from the curb-line in the business streets, thus allowing the outside pendent lamp to be hung directly above the face of the curb. The wiring of the standards is all under ground.

The contract specifies the following prices to the lighting company for maintaining the three sizes of lamps in the two systems and under the two operating schedules. The cost of installation is taken care of in these prices:

SCHEDULE OF RATES

	Ornamental		Residential
Size of Lamp	All Night	Midnight	All Night
40 cp	......	$12.00	$13.50
60 "	$19.50	14.50	19.50
80 "	23.00	18.00	23.00

Included in the cost of installation, that of the standards, bases, conduits and wire was as follows: 5-lamp standards, $40;

3-lamp standards, $36.50; 1-lamp standards, $30. These figures are based on one standard of each kind, exclusive of lamps, globes, sockets, etc. The 3065 ft. of steel-armored cable cost 36 cents per foot and an additional 5 cents per foot for laying. The lead cable, of which there was 4550 ft., cost 21½ cents per foot, and the bases for the 86 posts were estimated at $3.50 each. The fiber conduit laid cost 51 cents per foot, and the cost of the globes, when freight charges, crating, etc., were paid, was approximately $1.00 each.

In the old open-arc lighting system there were 161 units, consuming 500 watts each and operating on 9.6 amp. Seventy-one of these lamps burned on all-night schedule and the remainder till midnight, in the former case the city paying the central station $80 each, and in the latter $55 each a year.

Concrete Tungsten Posts at Ann Arbor

We are all familiar with the metal posts for tungsten clusters, many of them of great beauty, but it is quite interesting to note that a number of concrete posts of plain, simple construction were set up last year at Ann Arbor, Mich., and may afford a suggestion for use elsewhere where æsthetics are not an important element in the question. The cost was $7.47 per pole. The posts are 25 ft. long, 8 in. in diameter at the base and 5 in. at the top, and are reinforced with four ⅜-in. steel rods, one at each corner. Complete, the posts weigh 1185 lb. each. Six inches from their tops single arms or buck arms are cast into the concrete, 1½ × ⅝ × 18 in. steel angles being used. These arms are bored for ⅝-in. bolts, which support the insulators carrying the line wires. Nineteen feet from the butt of the pole three ½-in. bolts are cast into the concrete for carrying the lamp bracket. The posts are set 5 ft. into the ground, bringing the lamp 12 ft. above the curb. On each post is stenciled the number of the lamp and its circuit. The wooden forms required for the construction of these poles cost $200 to build, $155 of which was for lumber and mill work. A concrete mixture of one part Portland cement, two parts sand and four parts ½-in. crushed limestone was used, the cement being mixed wet and poured and troweled in the form. The posts were allowed to set two days and then to lie on the form base four days longer, after which they were seasoned for ten days before erecting. The cost of 100 poles was made up as follows:

30 tons crushed stone, at $2.60	$78.00
18 tons sand, at $2.75	49.50
47 barrels cement, at $1.60	75.20
4300 lb. reinforcing steel, at 2.58 cents	110.94
600 lb. cross-arm steel, at 2.20 cents	13.20
Labor	420.00
	$746.84

The average cost per pole was thus about $7.47 each, exclusive of the first cost of the forms. The poles were distributed by loading them onto a carrier drawn by an electric truck. On reaching the place of erection the truck was connected to tackle and the pole raised into position by running the truck off to a distance.

Spectacular Incandescent Lighting

Among many instances that might be cited of fine spectacular lighting with incandescent lamps during the past year, perhaps that which stands out most conspicuously is the illumination of St. Patrick's Cathedral, New York City, on the return in January of Archbishop Farley after he had been raised to the Cardinalate by His Holiness Pope Pius X. The pride of the citizens and the joy of the flock found admirable expression in one of the most beautiful nightly spectacles the city has ever seen. The plan included all of the vertical and horizontal lines, the arches, windows, buttresses and doors, as well as the two great spires and the crosses surmounting them, 340 ft. above the asphalt of Fifth Avenue. In addition, there was outlined over the main entrance in various colored lamps the coat-of-arms of the cardinal, a shamrock with two eagle heads to the left and two doves on the right. The "Elblight" system of cables was used extensively on the spires, and there, during the bitterly cold weather, the steeplejacks working on the job were clad with electric heating-pad jackets in circuit with the lights, to keep them warm. Some 27,000 8-cp lamps were required in outlining the building, and 20 miles of wire. A mile of independent low-tension feeders was run underground from the Edison substation at Fifty-third Street and Sixth Avenue to and around the cathedral to supply the energy. Surrounding the cathedral were arranged twenty-four 5-lamp gilded tungsten standards equipped with 150-watt lamps. All of the switches of the decorative lighting circuits were closed on the evening of January 17, and the entire lighting system was controlled from the substation. By this means the illumination was brought up gradually. Special lighting was also arranged temporarily for the interior. Forty-watt tungstens replaced the 2100 16-cp carbon filament lamps, and the seven great chandeliers, 130 ft. above the floor, five in the nave and one in each of the transepts, were lowered. The lamps around the columns were also changed. The sanctuary illumination was modified to accentuate the beauty of the marble altar and reredos, the altar itself remaining untouched. This superb piece of work was carried out under the designs and supervision of Mr. T. E. Murray, Vice-President of the Edison Company.

The Wire-Drawn Tungsten Lamp

During the summer of 1911 the Interborough Rapid Transit Company, of New York City, conducted exhaustive durability tests of several types of high-efficiency incandescent lamps. As the result of these tests it has equipped the 780 cars used in the Subway express service with wire-drawn-type tungsten lamps. For the purposes of the test, 100 lamps of each of five types were installed on cars selected for the test but operated in the regular service. The types of lamps tested were the metallized carbon filament, the tantalum and the wire-drawn tungsten. Each of the lamp sockets in the test cars was numbered, and all test lamps were labeled when installed with the number of the socket and car and the date when put in. The lamps were inspected every day and all burned-out or broken lamps were carefully recorded before being renewed. From a study of the schedules and observations of the running time on open track during the daylight hours the daily average time during which current was on in the lamps was estimated at eleven hours, and the life of the lamps was computed on this basis. The renewals were divided into two general classes, lamps burned out or otherwise defective and lamps accidentally broken or entirely missing. The comparative life of the test lamps was calculated on the basis of the percentage of lamps still in service at the end of each 100 hours of burning. The ordinary rigid sockets with which the test cars were originally equipped were used for all test lamps.

The tantalum lamps failed rapidly from the time they were first installed, as the filaments were quickly broken by the vibration. A similar result was obtained with the metallized carbon-filament lamps. The tungsten-filament lamps gave the best results. A few lamps with poor filaments failed very quickly after they were put in, but about 65 per cent had a life of 1000 hours or longer. The failures increased rapidly after 1000 hours, but at the end of 2700 hours 12 per cent of the lamps were still in good serviceable condition. When the tests had been continued far enough to permit of a fair comparison of the different types of lamps, it was decided to adopt the tungsten lamps for the 780 Subway express train cars. The installation of these lamps was begun about September 1, 1911.

In an address last December before the Chicago Section of the Illuminating Engineering Society, Mr. C. W. Bender described the process of drawing tungsten wire from ingots through diamond dies. Drawn-wire tungsten filaments have been found to be stronger at the end of the life of the lamp than pressed filaments of the same metal after a few hours' burning. The drawn-wire lamps are almost exclusively used now in all of the new installations for automobile and car lighting. The filaments are mounted on a central spider, in much the same manner as the tantalum filament is mounted. As the result of a number of tests, it seems to be established that, with energy at 10 cents a kw-hour, the best consumption of the drawn-wire lamp varies from 1.03 watts to 1.22 watts per candle. One objection to the drawn-wire lamp is its comparatively early blacking compared with the pressed-filament lamp, but even with this drawback the lamp still exhibits a life of 1000 or more hours up to 80 per cent of the initial mean horizontal candle-power. Further, as this blacking effect increases the tip lighting by some reflection from the inside of the blackened zone, the figure for 1000 hours' burning is 85 per cent for mean spherical candle-power. It might be well, said Mr. Bender, if the lamp were rated in mean spherical candle-power.

Asked why in American drawn-wire lamps the filaments are not put near the central support, as in foreign lamps, Mr. Bender answered that all lamp design is a compromise. If a spider of smaller diameter is used there is a greater opportunity for the filaments to short-circuit. Furthermore, this contracted spider results in greater heating of the central glass stem and so causes blacking from that source. Mr. Bender believed 220-volt drawn-wire lamps to be entirely satisfactory. He added that one of the advantages of the drawn-wire lamp over the pressed-filament lamp is its greater uniformity, which makes both for better efficiency and better candle-power maintenance. Another interesting statement made by the speaker was that the lamp manufacturers are now able to offer 15-watt drawn-wire tungsten lamps for 110-volt circuits.

We have now had over four years of the tungsten lamp, although it is curious to note that in some places, by some people, it is still discussed as a rank novelty. No great advance in any art can come without its drawbacks and disadvantages, but it will probably now be conceded that the benefits brought by the tungsten lamp exceed vastly, if not immeasurably, any of the offsetting ills. The public may have been the greatest gainer, but who shall complain of that?

The Government Lamp Suit

Last October the United States Circuit Court at Toledo, Ohio, entered a decree in the famous suit of the Government against the incandescent lamp companies, under the Sherman Anti-Trust Law, which seems to settle the status of the old carbon-filament lamp—and little else—except in deciding that business under the law is better done in one certain way than in another. The decree ordered the dissolution of the National Electric Lamp Company, of which the entire stock is held by the General Electric Company, and of twenty subsidiary companies, the business of which must hereafter be conducted in the name of the General Electric Company. The companies were enjoined from making agreements with manufacturers of lamp-making machinery and glassware which would prohibit the latter from making similar agreements with others; all parties to the suit were enjoined from entering into any combination or agreement fixing re-sale prices of lamps, or imposing conditions having any bearing on such re-sale, or discriminating in any manner against purchasers who do not buy ordinary carbon-filament lamps from the manufacturers, also of other lamps covered or claimed to be covered by patents, such as graphitized and metallic-filament lamps; the practise was enjoined of imposing differentials in price between lamps which do not differ in quality and efficiency, and of allowing discounts based on aggregate purchases from different manufacturers, or on aggregate purchases of different types of lamps, or making favorable prices having the purpose to drive rival manufacturers out of business. The decision in the case appears to be quite sharply limited in effect to creating an open market for the ordinary carbon-filament lamp, in which trade competition alone will regulate prices. As that type of lamp, however, is now less used than the modern high-efficiency lamp and is rapidly becoming obsolete, the consumer will not be greatly benefited by its release from artificial price conditions. It would appear that the great patent questions involved are still unsettled, but that the owner of a lawful patent may grant to another a license as in the old way except that the licensor shall not try to fix a re-sale price to which the licensee shall be restricted.

As a result of this decree the manufacturers of incandescent lamps have been working on a plan for the readjustment of the method of conduct of their business to conform with its provisions. This plan has been perfected and went into effect with the General Electric Company and the companies operating on licenses under its incandescent lamp patents on March 1, 1912. Under the new plan, incandescent lamps will be sold by the manufacturers without restriction as to re-sale prices. The manufacturers will, however, follow the policy of selling to consumers directly or through regularly appointed agents. The properties of the constituent companies of the National Electric Lamp Company have been transferred to the General Electric Company, and those companies will hereafter conduct their business as a part of the General Electric Company. The personnel of the organization of the National Electric Lamp Company and of its constituent companies will not be disturbed, and the men to whose efforts the successful development of the industry is so largely due continue their activities in directing the business of which they previously had the management.

Vapor Lamps

The various vapor lamps remain in widespread use, but, so far as this country is concerned, the quartz tube mercury lamp has not yet been added to the number in general commercial use.

An interesting study was reported during the year of the effect of the light of the mercury vapor lamp on the eye. The observations were made on twenty-eight cases by Dr. C. H. Williams, assisted by Dr. Louis Bell, and the former sums up the results as follows: "In comparing all the cases examined, the fact which stands out most distinctly is that in no case does a careful ophthalmoscopic examination show signs of trouble with the optic nerve or retina which cannot be more properly attributed to other causes. Of the twenty-eight cases, twenty-three showed a normal fundus. One case had old changes in the macula region of one eye antedating the use of the lamp, with the fundus in the other eye normal. Three cases showed a slight congestion of the retinal veins, probably due to uncorrected errors of refraction. In one case there was a slight haziness in the outline of the optic disc in one eye, with some myopic astigmatism, and normal fundus in the other eye. In no case was any pathological change found in the crystalline lens or the transparent media of the eye, not even where there had been years of work under the most trying conditions possible, where the men were day after day facing the glare of scores of lighted mercury-vapor tubes on the racks of the testing room.

"Immediately after leaving work under the mercury lamp, color fatigue was clearly observable, as was to be expected. This was slight at the junction of red and green, the yellowish and green lines of the mercury spectrum apparently tiring the red and green sensations almost equally, and was chiefly observed at the blue-green junction, where the greater fatigue of the green came into play. The fatigue is merely temporary, as is well shown in the last two cases described, and was least noticeable in some of the cases who had worked longest under the light, as if the eye had acquired a certain degree of immunity to the unusual stimulus. Except for this temporary color fatigue, none of the cases showed any effects whatever ascribable to the illumination under which they worked."

It was reported from Paris in March, this year, that "a member of the committee appointed by the Minister of the Interior for determining the most 'hygienic' form of artificial illumination has declared that the committee will condemn several popular forms of lighting, and that those forms which are the nearest approach to daylight are quite unpopular. As a matter of fact, he said, the nearest approach to daylight is the acetylene flame, which contains a large relative amount of blue-green rays.

The proportion of ultra-violet and blue-violet is rather lower than that of daylight, but by filtering the light through a suitably dyed screen it is easy to obtain an exact reproduction of daylight. The same thing can, of course, be done with electric light. An arrangement of metal-filament lamps in which the rays are filtered by a blue-violet screen and are then cast down upon a table, illuminating the latter with 'daylight,' has been tried and found of great value in industries where the mixing of colors at all times of the day and in all weathers is part of the general routine."

Interior Illumination

Thanks to the efforts of the Illuminating Engineering Society, not forgetting those of our own committees, the many problems connected with interior illumination are now more closely studied, are better understood, and are more successfully solved, than ever before—with consequent saving of eyesight and real economy in service. One could hardly select a better example of such close analysis of the subject than that presented in the recent Society paper on "Theatre Illumination," by Messrs. F. A. Vaughn and G. A. Cook; a paper in line with the National Electric Light Association report of last year on industrial or factory lighting, which has received such general attention. The many factors that enter into all such cases of special application are not always appreciated, but, as the authors point out, the branches include physiology, psychology, ophthalmology, architecture, interior decoration, fixture design, with a fair sprinkling in of other arts and sciences. One happy paragraph may here be quoted, because of its even wider general application: "In theatre illumination, laws of light, illumination and psychology should be so used that the patron of the theatre will neither be aware of any disturbing influence from the lighting conditions nor have his enjoyment—the purpose of his presence in the auditorium—impaired; so that it will not detract from the pleasure of social intercourse through the medium of little visits between the acts, or visually through the use of opera glasses upon the well-dressed audience; so that the temperamental eccentricities and the artistic feeling of the artists will be catered to by pleasant, effective dressing-room lighting, and by realistic, non-disturbing stage lighting; so that the multifarious tastes of the laity from every station in life who frequent the performances will be appealed to in as average and uniform a manner as possible; so that the deception of the audience, by illumination effects, is accomplished; so that the attention of the passer-by will be attracted to the management's desire to receive their patronage, and so that the warm and inviting quality and quantity of the illumination of entrances and foyer will be effective. To say the least, the requirements of effective theatre illumination are numerous and varied."

ELECTRICITY IN AGRICULTURE

The application of electrical energy, in various forms, to agriculture as well as directly to plant life, has continued to occupy serious attention and to yield encouraging results. This Association has done its share in missionary work in that field and is still engaged in progressive effort. At our Convention last year, on the initiative of its Committee on Electricity in the Rural Districts, the Commercial Section adopted resolutions urging the subject upon the attention of the Department of Agriculture. The author of the present Report had the honor of presenting these resolutions, approved by the National Executive Committee, to Secretary Wilson, of the Department of Agriculture, at Washington, the chief idea being a study of the subject by the Department and the issuance of one of its Bulletins, devoted to the use of electricity on the farm. At best, such a bulletin would, of course, be only an amplification of the work already being done by the Association, but the weight and authority of the Government, put behind an inquiry of this kind, would obviously secure results possible to no private authority, and prove the matter to be one of universal interest and importance rather than the self-seeking of a mere group of corporations and manufacturers. In the successful solution of these new problems and the re-birth of our agriculture under electrical conditions, no small part of the national prosperity is at stake. It is a good sign that the National Electric Light Association Commercial Section has an excellent Agricultural Committee again this year, making a report. To a certain extent, the subjects falling under this head belong largely also in the domain of hydro-electrics and power transmission, but such overlapping cannot be helped.

A Little Data on the Subject

At the meeting of the Illinois State Electrical Association last year, this subject was brought up, and some most interesting statistics were presented. Mr. E. L. Brown, of Elmwood, Ill., described, for example, his local system comprising 30 miles of transmission lines connecting eight small towns and supplying about fifty farms. Mr. R. H. Abbott, of Petersburg, Ill., described his service to farmers along the route of a 16,500 single-phase transmission line, with step-down transformers lowering to 2400 volts for the primary distribution. All transformers, poles, lines, lightning arresters, etc., are owned by the farmers, each of whom pays a minimum charge of $2.00 per month. In like manner, Mr. H. W. Bullock, of Eureka, is giving service to farmers in Roanoke and Metamora. Mr. E. P. Edwards, of Schenectady, N. Y., stated that there are 30,000,000 horses and mules in this country, 90 per cent of which are employed in agriculture. In spite of the attention given to improving crops and to conservation on the farm, practically no data are yet available on the best forms of motive equipment which can be used and the cost of performing the simplest farm operations. It is known, however, that about 10 hp-hours are required to plow an acre of ground. Manual labor on the farm is paid an average of 11 cents per hour, and, as such labor is equivalent to about ⅛ hp, human energy is seen to be worth 88 cents per hp-hour. The average cost of an animal hp-hour is 8 cents, including interest, maintenance and depreciation of stock and equipment. This evidently opens up a market, and, assuming that only one-fourth of some eight or ten million farms are now reached by central-station lines, the vista disclosed of a new field of application is of startling magnitude.

An interesting example is furnished by the work done on the Bacon farm, near Grand Forks, N. D., where the energy is supplied by the Red River Power Company. A gasoline engine was formerly the prime mover, but now a 3-phase motor mounted on a portable truck supplies all the service. In like manner, the Bellows farm of 640 acres, 4½ miles from Maryville, Mo., not only has electric light for the house and barns from the local electric light company, but a 20-hp induction motor on skids is moved around the place and can be connected at several points in the barns and silos where work is to be done. The 3-phase, 60-cycle, 2300-volt transmission line, with painted poles and creosoted butts, was built by the company at the expense of Mr. Bellows, costing about $425. There are nine points at which the motor can be put directly at work. At Montrose, Col., the local company has a special lighting circuit nearly 6 miles long, built by itself, to reach a group of large fruit ranches west of the city. There are no fewer than 38 such customers, with 14 transformers, from 3 to 5 kw. The line consists of a single-phase circuit of No. 6 copper on glass insulators, with wooden poles and cross-arms, the poles being Idaho 30-ft. cedar with 6-inch tops and set in concrete foundations to a depth of 18 inches, the pole bottoms reaching a depth of 5.5 ft. The cost of the line, with arresters, transformers and meters, was $800 per mile.

As to the line material, there was a discussion at the Illinois meeting on iron wire in distributing circuits. Mr. Theodore Bass, of Farmington, Ill., described a service to a group of three farms supplied with energy from his 16,500-volt transmission line. The farmers hauled and erected the poles, paying $200 for the high-tension step-down transformer and the three distributing transformers. Iron wire is used for secondaries. Mr. A. O. Brown, of Elmwood, however, cited an instance where he had attempted to operate a 5-hp motor at the end of a mile extension of No. 8 iron wire, but found the motor would deliver hardly 2 hp. Mr. W. G. Austin, of Effingham, on the other hand, reported the successful operation of a 7-hp motor at the end of a mile of 2200-volt line of No. 10 iron wire. Another member declared he had constructed 32 miles of 1100-volt line, using No. 6 hard-drawn copper wire on 30-ft. poles, at a cost of from $150 to $200 per mile. Mr. S. B. Cushing, of Chicago, pointed out that iron wires when used should be tested at frequent intervals for strength, since they are seriously attacked by rust. The occurrence of a single accident from fallen line wires, he observed, might prove much more expensive than the cost of many miles of first-class construction. Dr. E. J. Berg, of the University of Illinois, explained that for all practical purposes within 1 per cent the effects of self-induction can be disregarded in the case of iron wire. Mechanically, he added, copper has the great advantage of resisting rust. For such discharge paths as lightning rods the material of the conductor has little effect, the form of section, however, being very significant, since the law of loss by induction follows the law of torsion. Professor Berg also explained the discharge of lightning surges by corona in the case of certain 110,000-volt transmission lines which are without other arresters. In these cases the diameter and section of the conductor is of more importance than its material. Mr. Frank J. Baker, of the North Shore Electric Company, Chicago, discussed briefly the problem of the cost of making service extensions. The durability of cheaply constructed lines like those mentioned was open to question, he said, after they have been in use five years or more, while a single accident might cost the equivalent of the interest on many miles of first-class lines. It has not been the policy of the North Shore Company, said Mr. Baker, to ask the prospective consumer to pay any part of the cost of extension, the company taking the view that if the business is worth going after at all it is worth the preliminary cost of construction.

Reference may also be made in this connection to the work of the Petersburg (Ill.) Electric Light Company. When the news became known of its plans to build a 16,500-volt transmission line to Greenview and Mason City, a number of farmers along the way served notice on the company that if they could have the privilege of taking service at the town rates the right-of-way for the proposed line would be furnished free of cost. Thus practically forced into the supply of electricity to neighboring farms, according to Mr. R. H. Abbott, president of the company, arrangements were made to install several step-down transformer substations along the line, reducing to 2400 volts for distribution to the farms. These single-phase, high-tension transformers are mounted in small houses built on 25-ft. poles and are protected only by fuses. At the end of last year two such substations had been erected, one feeding a 2-mile, 2300-volt line supplying four farmers, and one a 2-mile line with two farmers. The 2300-volt lines are of No. 6 hard-drawn copper wire carried on 6600-volt porcelain insulators on 25-ft. poles set forty to the mile, and the regular distributing transformers are equipped with both lightning arresters and 2300-volt fuses. All of the transformers, poles, lines, arresters, etc., are owned by the customers, so that the company is without investment on their account. A minimum bill of $2.00 per month is charged each customer, the regular Petersburg schedule applying to the energy consumed. The farmers seem to appreciate the service and several have gone to some expense to fit up their places with electrical equipment, installing pump motors, fans, irons, bathroom heaters and other appliances.

At Liberty, Ind., the Liberty Light and Power Company furnishes electric lighting service from its 32 miles of 13,200-volt and 6600-volt transmission lines to a number of farmers in the vicinity. As the result of his experience with this class of service, Mr. Robert S. Ashe, president and manager of the company, states that the farmer is hardly to be regarded as a profitable customer, since, indeed, such service has not paid its way financially even when the farmer furnishes all construction material, transformers, etc. The farm owners in the neighborhood of Liberty and Richmond are very prosperous, but at this time they are using their electric service only for lighting. Their characteristic thrift and economy apply equally well to their consumption of kilowatt-hours, and as a result their bills usually run quite low. The company makes a minimum "transformer-loss" charge of $1.00 a month for each customer. During the winter months, however, some of the farm bills average $2.00 to $2.50, the rate for energy being 13 cents per kw-hour. Tungsten lamps are used for general illumination in the farmhouses, the commoner carbon lamps being employed in the barns and outbuildings. While the lines of the Liberty Company were not built especially for the supply of electricity to farmers, Mr. Ashe has been disposed to take the broad view that, to accommodate his farmer friends, connection wherever it is possible shall be made. "In doing this," he says, "we have brought great comfort and happiness to many people, and we feel that our reward is ample in the relief of so many of our friends from a part of the drudgery with which their lives are so fully surrounded. When we have the lighting business well developed in the towns which we serve, we hope to devote a part of our time to the farms, because of the general uplift it will be to the entire community which we serve."

Irrigation and Pumping

An important and somewhat distinct branch of this work has been that related to irrigation and pumping. As pointed out by Mr. R. B. Mateer, of the Denver Gas and Electric Company, a good deal of this work has been done in the West, based on windmills, gas engines, etc., but with the combination of wells, internal-combustion engines and ditches a failure, the agriculturist began to consider the previously neglected electrical pumping proposition. First cost and operating expenses had seemed huge when compared with the lucid statements of costs made by the promoters of oil and gasoline pumping units and reservoirs and irrigation ditches. But hundreds of acres of land remained unsought as a result of the failures experienced by those who depended upon the old systems of supplying water. The aggressive policy of certain central stations in authorizing the construction of the necessary pole line to reach such loads has resulted in many interesting and very profitable installations of motor-operated pumps. Water, when and where desired, is now turned upon the thirsty soil; vegetables in abundance supply the city markets and surplus quantities are crated and shipped to less-favored sections of the State or country. Thus fruits and grain add to the wealth of the local county as the result of irrigation and motor-operated pumps. A recent installation of this kind, promoted entirely with private capital, is that of Mr. M. A. Lunn, near Denver, Col. In this case 80 acres were supplied with all the water necessary to change dry, arid land to fertile, productive soil. A 35-hp, 3-phase, 220-volt motor is belted to a centrifugal pump which is connected to two lines of 12-in. pipe. The pump is capable of delivering 1100 gal. per minute against a head of 50 ft. The water is pumped in two directions to discharge points 1320 ft. north and 1320 ft. south, respectively, of the pump house. From these heights of 50 ft. it is allowed to flow by gravity through ditches over the adjoining fields. The 13,000-volt transmission lines are tapped for this service, the pressure being reduced to 220 volts at the pump house. One interesting feature of this 13,000-volt transmission is its construction under the 100,000-volt transmission line which feeds from the Shoshone power plant. All the water used is secured through filings made on seepage and underflow in a stream known as Dry Creek, an earthen breastwork serving to collect the water flowing in the creek and such seepage as the lands situated on higher levels may supply. Gasoline and oil-engine competition in this case was overcome by the efforts of the power department of the Denver Gas and Electric Light Company, which supplies the energy used. The results of the installation are not only satisfactory, but highly gratifying to the consumer, and will likely result in additional irrigation plants. In fact, such a pumping load is a revenue-producing installation for the central station, a boon to the agriculturist and a blessing to the public, which benefits from the resulting abundant crops and low prices.

Even more interesting, because more extensive in its sphere of influence, is the work to which attention is drawn by Mr. C. H. Williams, of the Northern Colorado Power Company, whose system relies on energy from coal, with steam turbines, and whose territory extends from Denver, on the south, to Cheyenne, Wyo., on the north, and from the foothills of the Rockies to a line 50 miles eastward on the plains. All through this arid belt, where rainfall is light and surface water rather unreliable, irrigation is a great stimulus to cultivation and crop values, and the company has gone thoroughly into it—to reach the underflow by electric pumping, as one part of its work. The generating plant is 13,200 volts, 3-phase, 60 cycles. For the main transmission 44,000 volts is used on the line, with branches at 13,200 volts, 6600 volts or 2300 volts. The system already built reaches thirty-two towns in the center of the richest agricultural district in northern Colorado. The lines are run on wooden poles, forty to the mile, with substations and switching stations about 20 miles apart on the main line, so arranged that any substation can be cut out without interrupting the service. All the territory covered has a copious underflow. The wells dug for irrigation are peculiar. They are either circular or rectangular in form, with concrete curbings lowered down to the water-bearing strata. The pump is submerged and the vertical shaft run up to a framing which either carries a motor with vertical shaft directly coupled or a pulley belted to a motor placed in a housing at the side of the well. The lift being but moderate, centrifugal pumps are used, driven by 2300-volt motors. During the pumping season of 1910 careful tests were made on fifty-seven pumping plants with approximately the following results. With an irrigation plant arranged to supply a quarter-section of 160 acres lifting through a 25-ft. head, the average investment required is $7.45 per acre. The cost of operation varies from $1.75 to $2.25 per acre-foot—that is, a foot of artificial rainfall can be obtained for this modest sum. Over much of the territory this additional foot is all that is required, although in other places 2 ft. might be necessary. Allowing 10 per cent as fixed charge on the pumping investment, the ultimate cost to the farmer for an acre-foot amounts to only about $2.75. This is much lower than the ordinary cost of water rights and their maintenance, with the additional advantage that the water is always available just when it is needed. The gain by this ability to regulate the time of flow to the condition of the crops has led to not a little pumping by farmers who already have water rights. Besides the use of electricity for pumping, a considerable amount of auxiliary farm machinery is operated in the same manner, and even electric plowing there begins to look highly feasible.

THE LARGER USES OF CURRENT

Electric Vehicles

Probably no use of current has seen greater increase during the year than that connected with electric vehicles, chiefly because central stations have become more alive to the opportunity and have tried to do their share in fostering the industry. In many cities these interests have undertaken the development of garages, and in others have taken up agencies for various vehicles. The phenomenally hot weather last August and September did much to call attention to the advantages of the electric automobile. Mr. F. D. Pembleton, of the Public Service Electric Company, New Jersey, compiled statistics showing that the loss of horses during the hot wave was 3752 in four cities alone, namely, New York, Chicago, Philadelphia and Boston, the respective figures being 1708, 1483, 351 and 210. The money loss was probably considerably in excess of $1,000,000. In commenting on these figures the editor of the *Question Box* of the National Electric Light Association *Bulletin* stated that during the period of great heat, manufacturers of electric trucks and vehicles were swamped with orders, but few of which could be filled because it is practically impossible to turn out trucks and delivery wagons off-hand at call. Even when a standard chassis is ready, the top is something that cannot be produced in a day or a week under present conditions, but perhaps in the near future some papier-maché artist may solve these difficulties "while we wait."

At the meeting of the Boston Electric Vehicle Club last January, some very striking figures were presented as to the experience of the Boston Edison Company during 1911. At the beginning of the year the company owned 40 gas cars and 8 electric cars, while in December the process of changing over equipment had resulted in the ownership and operation of 36 cars of each type. This represented an increase of over 300 per cent in the electrical equipment. Comparative figures covered equipments maintained in the company's in-town garages for the last six months of 1911. In this period the company had an average of 28.5 gas pleasure and commercial cars in service per month. These performed 3393 car-days of work, or 19.8 days per car per month. There was an average of 23.8 electric vehicles in service per month, these giving an output of 3506 car-days, or 24.6 days' work per car. There were 29 tow-ins of gas cars in the period, or an average of 1 for every 117 car-days, representing about 1 per cent of the trips. The electric cars had 11 tow-ins, or 1 in 319 car-days, representing 0.31 per cent of the trips. Each gas car averaged a tow-in three times a year, compared with once for the electric machine. The average length of the tow was 6.7 miles for the gas cars and 1.7 miles for the electric cars. This appears due to the fact that trouble overtakes a gas car on the road without warning, while most of the difficulties with the electric cars were due to insufficient battery charging, new drivers, ampere-hour meters going wrong, or improper operation by employees not under the control of the transportation department. Each gas car was out of service an average of three days when taken off the route, compared with the reappearance of the electric machines on the following morning without fail in every instance. The service efficiency of the two classes of cars, as expressed in the ratio of working days to total days (including working days plus days in the repair shop), was 79.4 per cent for the gas cars and 99.4 per cent for the electric cars. It was pointed out that this margin in favor of the electric vehicle is a vital point in commercial service. The company's cars are all maintained by gasoline-car repair men, with the exception of a battery man who gives special attention to the charging, discharging and electrical duties. A saving of about $4,000 a year was realized in chauffeur's wages, it being necessary to pay the driver of a gasoline car about $3.00 per week more than the chauffeur of an electric machine. President Baker called attention to the fact that in a New York fleet of trucks the gasoline cars were in service 174 days out of a possible 310, while the electric cars were on duty 298 days. Two men maintained 22 electric cars, while 6 men were required to maintain 6 gasoline trucks. Mr. C. F. Smith stated that in bad, snowy weather the Boston Edison machines had practically all made their full mileage. Mr. H. M. Thomson gave figures showing that five teams of one and two horses fell off in mileage from 15.4 to 13.2 per day, as a result of a total snowfall in two days of 7.3 in., a significant testimony to the superior reliability of the electric vehicle.

There are other ways of determining the real efficiency of an electric vehicle, and the Commonwealth Edison Company, of Chicago, has devised an ingenious plan of checking up the operation of electric vehicles on a specific gravity basis, issuing a card to its private garage consumers that will enable them to find out "where they are at" with a lead-lead, sulphuric-acid battery. An interesting feature of this card, which includes columns for setting down the hours and rate of charging, energy consumption, specific gravity, miles run, etc., is the absence of any space for recording the voltmeter readings at the beginning and end of the charging operation. The voltage indicated by a battery is at best only inferential of the energy yet remaining in the plates, and, although this method is generally used as a convenient index to indicate the condition of the cells, many cases of battery abuse are on record whose cause can be traced to the fact that voltmeter readings alone were relied on by inexperienced persons for indication of when to cease charging. In other cases, where complaints have been made by garage owners that their charging costs were running unduly heavy, the Commonwealth Company has dispatched its battery experts to the spot only to discover that in the effort to bring a given battery up to its prescribed end-of-charge voltage the attendant was putting about twice as many kw-hours into the cells as they properly needed—not only wasting energy and casting unfair reflections on the cost of running the car, but also working damage to the plates. The real index to the condition of charge in a battery is, of course, the specific gravity of the sulphuric-acid electrolyte. As the cell is discharged the specific gravity falls, ranging from 1.280 in a fully charged condition down to 1.160 when the cells are about exhausted. It is by this record of specific gravity that the Commonwealth Company now urges its customers to be governed, along with records of the kw-hour input into their batteries and the miles of car-travel. The proper time for starting and stopping the charge is fixed by the reading of the hydrometer, and to show the simplicity and convenience of using this instrument in electrolyte withdrawn from one of the cells by means of a syringe, the company illustrates full size in its electric vehicle hand-book hydrometers in fully charged and discharged solutions.

For any given car a definite relation can thus be worked out for the number of amp.-hours or miles-travel in a battery in terms of its specific gravity of electrolyte. For example, a certain pleasure car which will run 72 miles on good streets when charged to a density of 1.280 can be positively relied upon to go 60 miles when the gravity has fallen to 1.260, 42 miles at 1.240, 36 miles at 1.220, 24 miles at 1.200 and 12 miles at 1.180, becoming fully exhausted at 1.160.

According to President Blood, of the Electric Vehicle Association of America, there is now invested $10,000,000 in electric trucks and $30,000,000 in electric pleasure vehicles. These figures should be doubled before 1915, and might easily be doubled within another year.

An interesting application of a special character is that to fire apparatus, as exemplified in the equipment of the ladder truck and combination wagon for the Springfield (Mass.) fire department, current being supplied by the United Electric Light Company. The truck carries a total length of 325 feet in ladders and a crew of seven men, and has four 3-hp motors and 80 cells of 17-plate battery; the truck weighing complete 10 tons and making 15 miles at full speed on a single charge. The truck has a guaranteed maximum speed of 20 miles per hour on a level roadway. The combination wagon carries a 40-gallon chemical tank, 200 feet of chemical hose and 1000 feet of regular fire hose. It is driven by four 3-hp motors and weighs 7 tons, having a speed guarantee of 30 miles an hour. Its battery equipment is the same as that of the ladder truck. On a 12 per cent grade, it has made a measured speed of 12 miles an hour. On a test run the ladder truck ascended a 12 per cent grade at a speed of 8 miles per hour. Its reliability is unquestionably superior to that of gasoline, on account of the complexities of the latter equipment. Three new electrically driven hose wagons were ordered last year by the city authorities, in spite of the vigorous competition of local gasoline machine manufacturers having a strong foothold in the city. The cost of energy for the first month's service was only $3.78, and for the second month $7.77, the rate being about 3 cents per kw-hour. The initial cost of the motor-driven ladder truck was about $12,000. A first-class horse outfit costs about $5500, but the annual cost of operation by horses is far greater than with electricity. Three horses cannot be maintained in the condition necessary for fire-department service on less than $1000 per year. The cost of shoeing horses with the best rubber pads is at least $4.00 per month. The small cost of energy is noteworthy, and even if a life of but a single year should be obtained from the battery, there would still be a margin of nearly 100 per cent in favor of electricity. The electric-vehicle equipment can be handled more rapidly and safely on the streets than horses, quicker acceleration is possible, a higher average speed can be maintained, and there are many incidental advantages.

The Value of Power Load

An admirable presentation of the value of the power load for central stations was made last September before the Vermont Electrical Association by Mr. F. M. Kimball, who outlined some of the special uses to which electrical energy is being put, as follows : To printing machinery, for its qualities of cleanliness, variations in speed, safety and economy; to elevators, where electrical devices for securing control in speed and direction of movement are more simple and effective than when any mechanical drive is used; for operating woodworking machinery requiring essentially a high rate of speed; for use in stores, markets, jewelry shops and by opticians; in shipyards and erecting works, in conjunction with machine tools that can be carried to various portions of floor or yard; in driving fans and exhausters, bellows, etc.; for bakers and confectioners, with whom perfect cleanliness is highly desirable; in pumping water for irrigation; in lumbering operations, enabling portable mills to be operated anywhere on the cut; in small refrigerating apparatus; on docks, to move and load merchandise; in building operations, to raise material; in cash-carrier systems in stores; in laundry machinery, hotels, etc.; for quarry work, in drilling. The output of motors is not far from 1,000,000 hp a year in the United States alone. Mr. Kimball divided the business tributary to every plant into three classes, the "spontaneous" business that comes unsolicited, the "obvious" business that comes by a certain amount of publicity, and the "latent" business that will come if systematic advertising and solicitation are brought to bear.

Large uses of electric power are indeed increasing rapidly in number, sometimes in new fields and quite often in old. Last summer, for example, the Worcester (Mass.) Pressed Steel Company contracted with the Connecticut River Transmission Company to supply current for 600 hp in motors, with a 24-hour load, with 3-phase, 60-cycle, 13,000-volt current, lowered to 500 volts. A number of other steel plant connections could be cited. Mining operations by electricity are exemplified by the Empire District Electric Company, of Joplin, Mo., giving service with 2300-volt motors in no fewer than 125 different mines, up to last November, for pumping, hoisting and other operations; the company having at that time 37,000 hp of generating capacity for all services and a motor load of not less than 16,500 hp, all energy being sold on a horse-power basis and on a demand schedule. A somewhat analogous service is the operation of oil-well pumps by central stations. Near Folsom, W. Va., a number of motor-driven oil wells have been in operation several years. Recently central-station service has been introduced among the wells of the Kern River and Los Angeles fields in California, where more than 300 motors are now at work, resulting in a saving of half the former cost of steam drive. Back-geared, star-delta, variable-speed motors are used, these motors being arranged with switches to convert their windings from star to delta connection. In star, the motors develop 10 hp continuously. Delta-connected they develop 30 hp and momentary overloads as high as 75 hp. Pumping and pulling is done on the low-power connection. When cleaning the well, the high power is required to hoist the bailer and to spud it with the sand reel. For spudding from the wrist-pin, only the low power is required. The motor-speed is governed by a street-car-type controller operated through lever and wire transmission. The wells average 850 ft. in depth and require 100 to 180 kw-hr. for cleaning. At 1.2 cents per kw-hr. this makes the cost of cleaning $1.20

to $2.16. The principal saving in cost of oil-well operation by motor is due to lack of standby losses and to good efficiency at low speeds, starting and overloads. Steam losses due to condensation during rain and snow are saved with the electric motor. Electricity is more flexible and easy to transmit than steam, responds more quickly, breaks fewer rods, does not run away when a rod is broken, and is more quickly reversed. In comparing costs of steam and electric drive the *Journal of Electricity, Power and Gas* submits the accompanying figures and makes the following comments :

COSTS PER WELL PER DAY

	Steam	Electricity
Labor, operating (oilers, well gang, boilermen and electricians)	$0.60	$0.40
Maintenance (fuel, water, oil and electric power)	2.55	1.35
	$3.15	$1.75

Saving electricity over steam, $1.40 per well per day.
Reduction in operating expense, 44.5 per cent.
(In the above, fuel oil is taken at 40 cents per barrel.)

On the basis of 233 wells, this means a saving in operating expenses of $119,000 per year. The market price of oil in the Kern River fields to-day is about 32 cents per barrel at the well. From the figures given it is obviously out of the question to pump wells by steam when the production falls below 10 barrels per day. In the case of electricity, the production can fall as low as 5½ barrels per day before the cost equals the selling price of the product. In the Eastern fields, where the oil is of a paraffine base, wells are actually pumped by electricity which produce only 2 and 3 barrels per day.

Another important field is that of textile mills, where electricity, having made its place, is now occupying the whole territory. In speaking of the South last September, before our Georgia Section, Mr. G. K. Hutchins, of the Columbus Power Company, presented statistics showing that on December 1, 1903, there were installed in textile mills 1053 motors, having an aggregate rating of 64,313 hp; by February 1, 1905, the number of motors had increased to 1740 and the aggregate rating to 87,614 hp; on January 1, 1910, there were installed 10,491 motors, aggregating 302,119 hp, and on June 1, 1911, 16,450 motors were in use, the aggregate rating being 387,975 hp. In the seven and one-half years under consideration the total increase in horse-power amounted to 603 per cent, while the increase in the number of motors installed amounted to 1562 per cent. On December 1, 1903, there were 14 central stations supplying electrical energy to textile mills; on January 1, 1910, there were 79 central stations doing so, 39 of these being operated entirely by steam. Among the distinctive features of the electric drive was mentioned the great flexibility it introduces into all departments of the mill, thus permitting the various processes to be kept balanced, and affording economical means in any department for overtime work which might be required for the finishing of special orders. The constant and uniform speed serves not only to secure a better quality of product, but experience has shown that there is obtained a substantial increase in product, conservatively estimated at an average of 10 per cent. The textile mill affords a very satisfactory demand for energy throughout its running hours, and furnishes an attractive day load for any central station of sufficient size to handle this class of business. He gave statistics relating to five textile mills in which the average of maximum demand taken for a twelve months' period showed a ratio of demand to the motor rating installed varying from 71 to 96 per cent. Mr. F. P. Catchings, of the Georgia Power Company, stated that of the 2300 cotton mills in North Carolina, about 25 per cent are now driven wholly by electricity. Evidently "yet there is room."

In like manner the cotton gin has loomed up as a desirable load for our Southern members. In general, electric companies in the South and Southwest have avoided cotton-ginning loads on account of their comparatively heavy demand during only a few months in the year overlapping the winter lighting season. The cotton-ginning season usually begins in August or September and lasts through December, running much of this period twenty-four hours a day, the latter part coming at a time, however, when the capacity of generators is needed for the evening lighting peaks. But successful work is already noted, including, for example, a set of seven 70-saw gins driven by two 50-hp motors on a meter basis. In the case of a 65-hp cotton gin at Coalgate, Okla., motor-driven by the local central station, not only does the electric company consider this good business, but the gin, though in the midst of a coal-mining section, has been able to reduce its total operating expenses from 50 cents down to 30 cents per bale, with energy at 4 cents per kw-hour. This gin has a capacity of about one bale each ten minutes when running continuously. With electric drive the heavy boiler operating and up-keep costs have been eliminated, together with the boiler-room force, leaving only one gin-stand man and one packer to operate the plant. The gin usually begins operation August 15 and runs until about the first of the year. The heaviest cotton-ginning season is near the middle of this period, when the gin is sometimes run twenty-four hours per day. At other times the ginning load by agreement is kept off the peak period of the lighting plant, being operated principally during daylight hours.

Serving the Laundry

The laundry comes midway between the power and the heating load of a central station, especially where there is the opportunity to use exhaust steam, which, again, is a field of work into which companies are throwing themselves with energy and success. For instance, in a Minnesota city of 4500 inhabitants, where the central station has 175 kw in generating equipment driven by Corliss engines, and does a steam heating business during the winter, summer use for its exhaust steam is provided by heating water for a steam laundry, three hotels, three barber shops and two apartment buildings. As the plant is operated with a back pressure of from 2 to 3.5 lb. per square inch, winter and summer, this water-heating business is found of great service in helping to carry the plant over the light-load summer period. The steam laundry is the best user of exhaust steam during the summer period. It is located adjacent to the electric plant and is supplied with exhaust steam for water heating through a 3-in. lagged pipe line, and with live steam for its large mangle through a 1-in. high-pressure steam-line. The large mangle, two washing machines and a centrifugal drier are all driven by electric motors and electric heat is used for the flatirons and collar machine. The electricity consumed for heating purposes and for motors has averaged about 615 kw-hours per month. Steam is sold by meter at an average rate of 70 cents per 1000 lb. of condensation. The income for the steam used by the drier, mangle, water-heater and several small machines has averaged $22.75 per month. The exhaust steam utilized by the steam laundry is about one-fourth the quantity passed through the steam engines of the electric plant during the summer period of operation. The heating of water for barber shops, flat buildings and hotels near the plant has also been found to be a profitable adjunct of the regular summer service.

The Combination Ice Plant

There is a great deal of inquiry and activity as to the installation of auxiliary ice plants and the running of customers' refrigerating plants, and the N. E. L. A. *Question Box* and its editor have had frequently to furnish data on these subjects. Some figures on the quantity of energy consumed during the year by several customers' motor-driven refrigerating installations were given by Mr. W. C. Anderson, of the Canton Electric Company, before the Ohio Electric Light Association, last July. Of the ten such installations now in operation in Canton several have been in use for eight or nine years, and all have been operated with entire satisfaction to their owners. Below is given the consumption, in kw-hours, of each of the six of these plants which are so metered as to give results available for comparison.

ENERGY CONSUMPTION OF REFRIGERATOR INSTALLATION

Tons refrigeration	3	3	5	3	5	3
Motor horse-power	7½	10	20	7½	26	16
January	146	646	1,950	...	51	516
February	70	733	2,210	...	34	120
March	112	846	2,070	286	102	892
April	322	1,627	2,600	1,528	1,240	2,168
May	247	1,654	2,850	1,622	1,139	1,928
June	403	2,826	3,600	2,050	1,069	1,976
July	343	4,718	6,040	2,062	2,649	1,978
August	540	5,633	5,590	2,060	2,518	2,212
September	591	4,174	4,790	1,712	2,100	2,200
October	576	2,145	4,200	1,476	1,639	2,052
November	453	1,161	2,630	804	944	1,540
December	335	229	3,310	...	936	264

Fortunately, domestic equipments chemical in nature are coming to the front, in which a small motor can meet the refrigerating necessities of families, and thus in time the domestic consumer should find it as extravagant to buy ice as to burn coal.

Before the Kansas Electrical Association last September, Mr. W. E. Sweezey, of Junction City, Kan., gave some interesting data as to combination ice plants. He has had over nine years' experience in combination-plant operation and at present has a 35-ton plant in connection with his station. The same boilers do the work of both plants, the demand of each varying almost inversely as the other. The figures of coal consumption submitted by Mr. Sweezey show how the sum of the two demands is nearly constant, one increasing almost exactly as the other falls off. The following table shows the tons of coal burned and the electricity and ice produced during six typical months of winter and summer:

	June	July	August	November	December	January
Tons coal burned ...	670	675	700	580	620	600
Kw-hours generated.	108,780	111,710	122,500	146,430	162,121	155,160
Tons ice made	965	1,055	1,050	112	54	32

To make a single ton of ice, observes Mr. Sweezey. costs about as much as to make 10 tons. In the Junction City plant the same engineers and firemen are employed the year around, as the coal burned and energy converted are practically uniform throughout the twelve months. The only extra labor required by the ice plant is for "pulling" the cakes from the cans, which for the 35-ton outfit costs about $5.00 a day. This amounts to an extra labor cost of about 25 cents per ton of ice, but, of course, in the plant accounting, the general station charges as well are divided up equitably between the ice and electric departments. As a result, the unit cost of producing a kw-hour in summer, when the output is decreased by 33 per cent, is almost exactly the same as during the heavy loads of the winter months. Mr. Sweezey holds that a town unable to support 24-hour service should not consider the installation of a combination ice plant. The establishment of the ice end, making all-day service possible, might, however, soon justify itself through the day load of fans and motors obtained, probably later making it worth while to run on through the winter with the day load acquired. When a plant is operating efficiently on a condensing basis, motor-driven compressor pumps may be desirable. If the station has a good load-factor and the generator engine is exhausting into the atmosphere, however, a steam-driven compressor may be preferred, since all the steam it passes, with perhaps more, will be needed as distilled water for ice-making. At Junction City it has been planned to install a steam turbine with a surface condenser, the water recovered from which will be free from oil and excellent for ice-making. Motor-driven compressors will be used. No trouble is expected in shutting down the refrigerating machinery during the peak lighting load. If the tank be carried along at about 12 degrees above zero, Fahr., the compressor can be shut off twelve hours without danger, for the tank temperature will remain below freezing at least as long as this if properly insulated. The danger lies in the tank temperature reaching a higher value and melting the ice of the cakes against the can surface. When this water later re-freezes it will expand, straining or bursting the cans. Ice storage is of real advantage to a plant, often enabling it to run fully loaded during the partial-demand periods of fall and spring and to shut down altogether during the winter, when only a few tons per day are used.

A plant recently started at O'Neill, Neb., by the O'Neill Light and Power Company, carries on the unique combination of an electric light motor and a creamery business. The combination of these two industries made it possible to install an electric light plant where otherwise the enterprise would probably be of an unprofitable character. The motive power is a 45-hp Corliss engine belted to a line shaft. From this line shaft is driven a 50-kw, 3-phase, 2300-volt alternator at 900 r.p.m. For the creamery business there is belted to the line shaft a 10-ton refrigerating machine. The other machinery for the butter and ice-cream making is also driven by the line shaft. The establishment has a capacity of one car of butter per week and 300 gallons of ice cream per day. Provision is made for adding another unit as the business grows.

This year a 75-ton absorption-type ice-making plant is being installed in the new turbine station of the Lexington (Ky.) Utilities Company. Utilization of the exhaust from a 25-kw pump turbine, location of refrigerating equipment and freezing tanks in buildings 500 ft. apart, and the use of cooling water at initial temperatures of 90 to 95 degrees Fahr., are among the unusual features of this new installation. A turbine driving one of the circulating-water pumps will furnish steam at 25 lb. back pressure for the operation of the absorption generator, which will be mounted on a platform in the new plant building, saving extra floor space. Exhausting into the atmosphere this turbine would take 50 lb. of steam per kw-hr., while at 25 lb. back pressure its consumption is increased only to 70 lb., resulting in a difference of about 20 lb. per hp-hr., chargeable to ice manufacture. This is believed to represent a consumption of about one-third the quantity of steam that would be required by a compound condensing compressor plant. During the summer-time the temperature of the cooling pond from which the condenser supply is taken rises to 95 degrees Fahr., and the increment through which the circulating water for the refrigerating plant is heated will amount to only a few degrees. The condensate from the two main 2500-kw plant turbines will be used as material for making the ice, supplying distilled water pure and entirely free from oil.

The Commonwealth Edison Company, of Chicago, has two or three ice-making customers on its circuits. The Lincoln Ice Company, which has a plant at Carolina and Elizabeth Streets, has an installation of about 450 hp in alternating-current motors used to drive compressors, pumps, hoists, etc. This plant has a capacity for producing 120 tons of ice every twenty-four hours, and it is operated throughout by electrical energy. Filtered water from Lake Michigan is used to make the ice, so that the method is essentially a raw-water ice proposition, in which central stations are particularly interested, because it is difficult to sell electrical energy for ice manufacture where a steam plant must be used to make distilled water. Anderson & Goodman have an 80-ton plant at South State and Forty-third Streets. Here the electric-motor equipment has a rating of about 350 hp. Both plants operate twenty-four hours a day at this time of the year. They buy electrical energy from the electric-service company on what is known as the "off-peak schedule," by which a reduced rate is offered in consideration of the fact that the consumer agrees not to take electricity between the hours of 4 p. m. and 8 p. m. during the months of November, December and January. By reason of the continuous demand and concessions made in the off-peak schedule, the ice-makers are able to obtain a very low rate for electrical energy, it being, in fact, in the neighborhood of 1 cent a kw-hour. The annual load-factor of this class of customers will figure out about 70 per cent. In view of this high load-factor, however, the business is satisfactory to the central-station company and constitutes a very desirable summer load.

Central Station Pumping

The subject of central-station city pumping has been brought up before various State Associations during the past year and will be treated in a paper before this Convention. It is an important subject and an inviting field. Besides that, the assumption of such a load by the local company or a transmission system will often remove any kind of argument or necessity for a municipal lighting plant.

Some figures were given before the Michigan Electrical Association last year by Mr. F. D. Spencer, of Cheboygan, who cited a number of examples with the data of electrical consumption for 1000 gallons pumped. One company operating a triplex pump driven by a 35-hp motor and pumping against 100-ft. head, reports an average consumption of 700 watt-hours per 1000 gallons pumped. Another company operating a motor-driven deep-well plunger pump reported a consumption of 1333 watt-hours per 1000 gallons pumped against a head of 120 ft. Another plant reported a consumption of 1220 watt-hours per 1000 gallons pumped by a motor-driven deep-well plunger pump lifting 110 ft. One waterworks plant in a city of 12,000 inhabitants installed a generator, placing a 7-hp motor at each of nine 65-ft. wells which fed a reservoir. A 100-hp motor driving a triplex pump delivered 1,000,000 gallons of water per day to an elevated tank and the distributing system. As a result the fuel cost was reduced one-half and the number of employees from thirteen to three. A small municipal pumping plant, by expending $6,000 in order to change from steam to electric drive, claimed to have reduced its operating expense $5,000 the first year, energy being purchased on the basis of $26.40 per hp-year.

At Coalgate, Okla., the water supply for the 4000 population is lifted from 250-ft. wells by one 50-hp motor-driven compressor supplying air-lift pumps and one 15-hp deep-well pump. The reservoir level is maintained by a 25-hp centrifugal pump capable of delivering 300 gallons per minute. Tests made by Mr. H. L. Reager, manager of the local central-station company, show that about 1.25 watt-hours are required by the deep-well pump for every gallon lifted. As this means a considerable saving over the air-lifts, the town has decided to replace the latter by deep-well pumps. The pumping station is 5 miles from the town and the power-house, and the attendant who takes care of the pumps augments his income by farming. All of the motors are 2300-volt machines. Ordinarily the pumps are operated from 3 p. m. to 5 p. m. and for several hours in the early morning beginning at 12 midnight. The town pays 4 cents per kw-hour for its pumping service, from which the central station derives an income of about $500 a month.

The water of Webb City and Carterville, Mo., is now supplied by motor-driven pumps. The joint waterworks company serving the two nearby communities has installed five Downie double-plunger deep-well pumps, each capable of delivering 500 gallons per minute from the 300-ft. depth and driven by 25-hp Westinghouse 25-cycle motors. The pumps discharge into a 5,000,000-gallon reservoir. Energy for the waterworks is purchased from the system of the Empire District Electric Company at the rate of $1.25 per month for each hp connected, plus 1⅛ cents per kw-hour consumed. The extreme flexibility of motor drive is again shown by a Louisville installation which furnishes water from a well of special quality to a brewery 3040 ft. distant. This brewery is located on the dry bed of Ballard's Creek, from which its supply was formerly obtained, but, with the use of the creek water for other industrial purposes at points above, recourse was had to the well above mentioned, the water of which is found especially valuable for use about the brewing plant. This water is raised by an air lift and is then conveyed the 3040 ft. from the well to the brewery by a 15-hp, 3-phase induction motor-driven centrifugal pump capable of delivering 200 gallons per minute. Service is supplied from the lines of the Kentucky Electric Company.

The Kansas City Electric Light Company has begun service under a contract with Armour and Company to pump 18,000,000 gallons of water per twenty-four hours for the latter's Kansas City packing plant. For several years the electric company has been furnishing the packing plant 6,000,000 gallons daily from a motor-driven pump on a barge anchored in the Kansas River near its generating station. The permanent new installation for delivering the larger quantity comprises a 500-hp, 6600-volt, 25-cycle motor, driving a single-stage centrifugal pump. This equipment is located in the basement of the company's operating station. The pump delivers into a 30-in. pipe leading to the packing plant, against a hydrostatic head of 111 ft. This water is used principally for cooling purposes in the refrigerating plants, and is required in nearly uniform quantities throughout the twenty-four hours.

The Kansas City Company also pumps its oil fuel by motor. The plant of the company, at Baltimore and Thirteenth Streets, is located in the midst of the steam-heating load which it serves, but is nearly a mile from the nearest railroad track. Formerly seven 3-horse teams were required to haul the fuel for this plant, which contains 3600 hp in boilers. A 4-in. oil pipe-line has now been laid directly to the station from the Missouri River power plant of the company, 7000 ft. distant, and the crude petroleum burned under the boilers is pumped this distance against a pressure of 90 lb. by Worthington duplex steam-driven pumps in the river station. A 6-in. feed-water pipe parallels the oil line and is used for supplying purified water to the steam-heating boilers. With its steam units exhausting non-condensing into the heating lines, the plant will thus be unique in its freedom from auxiliary apparatus.

Before leaving this topic it is only right to note that the huge coffer-dam around the wreck of the battleship "Maine" in Havana Harbor was emptied by three large centrifugal pumps each driven by electric-motor and mounted on a barge. The electrical energy for this unique pumping performance was furnished through submarine cable by our local member, the Havana Lighting Company.

Another unusual pumping performance is that of marsh drainage along the Illinois River. The Pekin and La Marsh Drainage District consists of about 2500 acres of land along the Illinois River, near Pekin, protected from overflow by a dike on the river bank running back to the bluffs at both ends of the district. This area is in charge of drainage commissioners, who drain the land and keep it in condition for cultivation by pumping the water from the inclosure over the dike into the river. Thus at all stages of the river the land is available for agriculture. The first pumping plant in connection with this drainage system was driven by steam engines. but, as the cost proved too high, the engines were superseded by gas engines supplied from a producer plant. After a year's service the gas-engine equipment was in its turn replaced by electric motors supplied with energy by the Citizens' Gas and Electric Company, of Pekin, which is controlled by the Peoria Gas and Electric Company. The plant of the Pekin Company is located on the opposite side of the river, and but a short distance from the pumping station. Since the electric motors were installed no trouble has been experienced in keeping the water out of the drainage district.

Electric Heating

Great advances have been made during the year in the art of electric heating, cooking, etc. Probably in no department of central-station industry is greater activity and diversity manifested, and this might be expected, for the range of application is infinite. Only a few examples need to be cited here. Committees of the Commercial Section will do the rest in their reports.

The Sikes bakery, of Milwaukee, Wis., which started with a 10-kw outfit has now installed a 30-kw, 360-loaf oven, because experience showed that compared with the ordinary coal-heated affair, the electric oven has the advantages of saving coal and ash-storage space, the expense, labor, dirt and annoyance of handling coal and ashes, unpleasant heat in the workrooms, etc. The electric ovens, which are built on the multi-story plan, occupy only one-fifth the space of the old ovens, and can be started up much more quickly, attaining a baking temperature within forty-five minutes after the heat is applied. The new 360-loaf oven has a maximum demand of 30 kw and a running demand of 20 kw. It is in use twenty hours a day, assuring a consumption of about 20,000 kw-hours per month. Under these conditions the bake-shops will earn a rate of 2¾ cents to 3 cents per kw-hour, the energy cost for baking amounting to about ⅛ cent per loaf. Wheat bread requires thirty minutes to bake, so that the large oven will produce 720 loaves per hour, or 14,400 per day. Rye bread requires a higher temperature, the "medium" heat, for "maintaining," and the "high" heat during forty-five minutes for baking. One of the greatest attractions of electric baking in the case of the Sikes bakery has been the advertising afforded, and the noticeable increased business which resulted following the announcement of the use of the electric oven. This advantage is felt to have offset fully the slightly higher cost of operation of the electric oven. Final proof that the owner considers it a good investment is afforded by the present plan to install an additional and much larger apparatus, giving a total capacity of more than 15,000 electrically baked loaves per day. Electricity is used generally for other operations throughout the Sikes bakery, motor-driven dough-mixers, cake-mixers, etc., being employed for preparing the flour, etc. Mr. M. F. Flynn, the heating specialist of the Milwaukee Electric Railway and Light Company, which supplies the electrical energy, has gone so far as to apply enclosed chafing-dish heating units to the frying pots in which the lard and cottonseed oil is kept boiling for dipping doughnuts. It is the common practise to heat these pots over open flames, and if the hot oil boils over bad fires may result. The application of electric heat removes this danger and helps to lower the insurance rates, which discriminate in favor of electric heating.

In connection with the installation of an electric range in the residence of Mr. Charles H. Williams, general manager of the Northern Colorado Power Company, Denver, the owner recently made a thorough study of the cost of electric cooking for a family of six persons for a period of ten days. Energy was supplied from the commercial circuits of the Denver Gas and Electric Light Company. The range is wound for 220-volt service and has two 10-amp. and three 20-amp. switches controlling corresponding baking and stove circuits. In the table are given the character of meal, materials cooked, maximum demand in kilowatts, consumption of energy in kw-hours and cost per meal, the data commencing with the installation of the electric range. The cost of electrical energy is figured at 5 cents per kw-hour. No previous experience had been had with electric cooking. Records were taken by a pen-recording wattmeter which was carefully calibrated with an instrument of precision. Much care was taken to keep the range absolutely free from dirt during the progress of the cooking tests.

COST OF ELECTRIC COOKING, FAMILY OF SIX, AT 5 CENTS PER KW-HOUR

Meal	Materials Cooked by Electric Range	Maximum Demand in Kilowatts	Kw-hours Required	Cost Cents
Dinner	4.5 lb. roast lamb; baked white and sweet potatoes; baked rice pudding	2.4	2.7	13.5
Breakfast	Oatmeal; baked apples, 8; coffee	2.24	2.5	12.5
Lunch	Stewed prunes; tea; potatoes for yeast	0.6	0.87	4.3
Dinner	Clock mechanism disconnected	....	....	....
Breakfast	Oatmeal; coffee; kettle of water	2.46	1.4	7.0

Meal	Materials Cooked by Electric Range	Maximum Demand in Kilowatts	Kw-hours Required	Cost Cents
Lunch	Warming potatoes; finnan haddie warmed; tea	2.2	0.65	3.25
Dinner	3.5 lb. veal roast; baked sweet potatoes; 10 baked apples; baked Irish potatoes	2.8	4.35	21.75
Evening	Cooking oatmeal	1.0	0.47	2.35
Breakfast	Warming oatmeal; coffee	0.68	0.55	2.75
	Testing oven, raising temperature from cold to hot	1.4	0.7	3.5
Dinner	Stewing 4.5-lb. chicken; boiled potatoes; toast	2.08	2.0	10.0
Breakfast	Baked apples, 8; oatmeal; coffee; baking bread; stewing prunes	2.6	3.20	16.0
Lunch	Boiled potatoes; coffee; 3-lb. pot roast	....	3.15	15.75
	Warming coffee; laundress 2 p. m.	0.05	0.1	0.5
Dinner	Boiled sweet potatoes; baked potatoes; baked cornbread	2.4	2.75	13.75
Breakfast	Coffee; oatmeal	1.0	0.55	2.75
Dinner	Beef stew; carrots; potatoes; prune stew	2.0	2.5	12.5
Breakfast	Baked apples; oatmeal	2.48	2.55	12.7
Lunch	Warming meat and coffee	1.4	0.7	3.5
	Baking three loaves graham bread	1.28	1.35	6.75
Dinner	Chicken stew, 4.5 lb.; cranberries, 1 qt.; potatoes, boiled (6 large)	1.00	2.15	10.75
Breakfast	Baked apples; oatmeal; coffee	2.5	3.25	16.25
Lunch	Warming meat; coffee	1.6	0.35	1:75
Dinner	Meat pie; potatoes boiled	2.2	2.5	12.5
Breakfast	Oatmeal; coffee	0.6	0.6	3.0
Lunch	Warming meat; coffee; potatoes for yeast	0.90	0.6	3.0
Dinner	Baked finnan haddie; boiled potatoes; baked apple, cream sauce	2.60	3.5	17.5
Breakfast	Baked apple; oatmeal; coffee	1.0	0.5	2.5

Experience showed that some energy was lost by changing from one heat to another in order to regulate the temperature properly. It was found that after the oven was once heated baking could be done at small cost. Roughly, the cost of electric cooking varied from 3 cents to 10 cents per day per person upon the basis of the above rate per kw-hour.

Unsuspected economies lurk in the use of electric cooking and heating, as for example in the lessened shrinkage of joints of meat, as compared with those cooked in gas or coal ranges. One pound of meat thus saved with all its juices will pay for a good deal of current and still leave the consumer on the right side of the balance sheet. A cheaper grade of coffee can be so prepared in an electric percolator as to be really quite superior to the more expensive coffees made in the usual way. Mrs.

W. E. Sweezey, wife of the manager of the Junction City (Kan.) Electric Light Company, in telling of her own experience with electric cooking in a paper read before the Kansas State Electrical Convention, September 21, stated that she found 30-cent percolator coffee all that could be desired and had given up the use of the 40-cent grade, thus saving the difference between $15.60 and $11.70, or $3.90, a year in her coffee bills. Mrs. Sweezey determined to make a test of the energy consumed by her electric cooking range in preparing a day's provender. On the day in question, after a breakfast of bacon and eggs, toast and coffee, a dinner of fried chicken with gravy, hot biscuits, baked sweet potatoes, mashed potatoes, peach pie and coffee, and a warmed-over supper, the total consumption shown by the meter was but 3 kw-hours. The Sweezey home is an electrically equipped household and Mrs. Sweezey is rapidly educating her townswomen up to her own level as to the conveniences and comforts of electrical service.

Yet other virtues lurk in the electric method. When the household of Mr. L. C. Stevens, of Crystal Lake, Ill., one of the district superintendents of the Public Service Company of Northern Illinois, awoke on a January morning during the "cold spell" it was found that the gas pipes were frozen up. As a gas range is used for cooking in this house, the outlook for breakfast was dismal enough, and with a temperature of 18 degrees below zero the prospect of beginning the day with a cold meal was not particularly cheering. In this emergency Mr. Stevens cast about to see what could be done with such electrical appliances as he had at hand. A percolator and a toaster would furnish coffee and toast, but that was hardly enough, so the electric flatiron was called into requisition, propped up-side-down and used for cooking eggs, which was accomplished satisfactorily. Here is certainly a new "talking point" in advocating the use of the electric flatiron in regions where gas pipes are liable to freeze up in winter. Incidentally it may be noted that a large amount of business was done this winter all over the country in electric heating by central-station companies in the way of thawing out frozen pipes. In New York City a large water main was "resuscitated" in this manner.

Note has already been made of the use of electric jackets to warm up the workers on the illumination of St. Patrick's

Cathedral, New York, before the return of Cardinal Farley. There are other possible developments of the same kind. Practically all astronomical observing work must be done in rooms or observatories at the temperature of the outside air to avoid optical and instrumental difficulties. The discomforts of a long winter-night's vigil at the eye-piece of a big telescope are readily appreciable, and many special constructions of instrument mountings have been devised to allow the observer to remain in a heated compartment. Most of those constructed gain the advantage of comfort at the serious cost of light lost in reflecting surfaces and mirrors. A novel "turret-type" mounting described by Mr. James Hartness, of Springfield, Vt., before the American Society of Mechanical Engineers in New York, December 6, modifies the polar-axis shaft into a turret casting 7 feet in diameter and weighing 2 tons, inside of which the observer may remain comfortable. The great weight and wind resistance of such a huge mass to be driven accurately by clockwork in siderial time, as compared with the usual equatorial mounting, led Prof. F. R. Hutton to suggest the use of electrically warmed garments for observers having the ordinary telescopic mountings. Such garments, he said, might be made but little larger than the body, so as not to be cumbersome, and need only supply the equivalent radiation losses at the bodily rate. The observer could then use in entire comfort the present simple and efficient mountings.

Nor is this all. For drying "rush" work rapidly so that it can be delivered or made ready at once for printing on the other side without offsetting, the Bradley & Gilbert Company, printers, of Louisville, Ky., makes use of a drying cabinet containing a 770-watt electric heater. This heater sits in the lower compartment of the 5-ft. by 3-ft. case, and above it, on a light tray of wood slats, the sheets to be dried are placed. Work which would require lying undisturbed twenty-four hours at ordinary room temperatures is thoroughly dried in the cabinet in thirty to sixty minutes and is then ready for handling of any kind. Twenty-five or fewer sheets may be laid on top of each other without offsetting in the drying cabinet and, of course, this drying space could be increased without additional expense by multiplying the number of trays. So much printing work is required on a rush basis that such an electric drying cabinet would seem to be a valuable addition to any but the smallest shops. And with such a dryer even the little job-work man might establish a reputation for quick delivery that would make his cabinet a paying investment. The application was suggested by Mr. A. T. Macdonald, general traffic manager of the Louisville Lighting Company.

Electrical incubators are another sign of the times. New Orleans seems to be one of the chief centers of disturbance in this respect, and some time ago the New Orleans Railway and Light Company had about sixty domestic-size electric incubators in use on its lines, besides several very large commercial equipments. The largest electric incubator in service in New Orleans, if not the largest anywhere, is a 6000-egg outfit built for Mr. A. Willoz, a professional poultry raiser. This incubator is 40 ft. long and 5 ft. wide, and contains forty separate compartments, each having a capacity of 150 eggs. Each compartment can be separately controlled so that all or any parts of the incubator can be operated, according to the number of eggs to be hatched. The controlling thermostats used do not completely break the heater circuit but introduce the comparatively high resistance of a small electric lamp when open. This avoids sparking at the contacts, while the flickering of the lamp makes easy the close adjustment of the thermostat. The maximum demand of the heater in each compartment is 60 watts, and the minimum, with the resistance in series, 7 watts, the average throughout the hatch ranging from 20 watts to 25 watts. The average consumption of energy is 10 kw-hours to 12 kw-hours per compartment per hatch, the cost of operating the incubator at the rate afforded by the New Orleans company being about 50 cents per compartment per hatch. Mr. Willoz, the owner, is reported to be very much pleased with the successful operation of his large electric incubator. He used formerly both oil-heated and gas-heated incubators, but declares that under no conditions would he return to these types of heaters.

MISCELLANEOUS USES OF CURRENT

So many new and miscellaneous uses are being found for electrical energy, it is difficult for any one man to keep up with them even in the way of record; but a few "high spots" may be glimpsed in passing.

Curing Meats

One of these is the curing of meats. An alert Cincinnati packer has discovered that if 60-cycle alternating-current be passed through the brine containing hams, the pores of the meat are opened to the fluid and the same hams can be completely cured in from thirty to thirty-five days. This effects a considerable saving in plant space, material, labor and investment, and the product obtained equals in all respects the naturally pickled ham. The green hams to be cured are piled on trays in wooden vats, 16 ft. x 4 ft. x 5 ft., each vat holding about 5000 lb. of meat. At the ends of the vats are the electrodes, each set comprising five 3½-in. carbon cylinders 4 ft. long, enclosed in unglazed 6-in. tubular tiles. After the hams are in position the brine, held at a temperature of 34 degrees to 36 degrees Fahr., is turned into the vat and kept circulating by motor-driven pumps on the floor below. From the switchboard a current strength of 30 amperes to 35 amperes, 60-cycle alternating, is turned through the vat, the drop in potential between the opposite sets of electrodes being about 40 volts. This discharge is usually continued throughout the pickling period of a month or more, although experiments seem to show that equally good results are obtained by using the current flow alternately twenty-four hours on and twenty-four hours off. In the same way, bacon, which ordinarily requires eighteen to twenty days, can be completely cured in three or four days. The plant now has ten of these 5000-lb. electric vats in continuous service. The curing vats have been in use nearly a year, and are the result of nearly four years' experimenting. During the course of these tests direct-current was first used, but the products of electrolysis liberated at the electrodes fouled the solution and caused changes in its composition. With alternating-current these effects are avoided, but the pore-opening action remains.

The Edison Electric Illuminating Company of Brooklyn, N. Y., received a request last year from a millinery establishment for an appliance that might be used to curl feathers. The company was equal to the occasion and experimented with an electric toaster. After enclosing the toaster in a wire screen for preventing injury to the plumes by contact with the coils, the method proved satisfactory, and several toasters so equipped are now in use by the applicants.

Paving by Electricity

The city of Leavenworth, Kan., began to repave a prominent business street, and let a contract for that purpose to a paving firm, which used a steam engine to run the paving machinery. Complaints from residents on the street soon followed on account of the smoke, dirt and noise from the engine, and the Leavenworth Light, Heat and Power Company finally induced the contractor to rent a motor for the power service. A 15-hp motor was mounted on a wagon running the paving machine, which moved three times a week; and as the company's lines were on the street where the paving was being done, connection was easily changed to the service wires, the meter and starting box being carried on the wagon with the motor. As the use of the steam engine had delayed the work, working nights was suggested to the contractor, and twelve 100-watt tungsten lamps on portable poles were installed to furnish light for the night work. The contractors were much gratified with the change to electricity and are getting excellent results.

Sewage Purification

Oklahoma City, Okla., has contracted with Mr. W. R. Molinard, general manager of the Oklahoma Gas and Electric Company, for 130 hp to be used for the electrolytic disposal of the city sewage. A 75-hp purification plan has been installed in the Packingtown district. The scheme of sewage purification used is similar to that at Santa Monica, Cal. There would appear to be a large, wholly new field of central-station activity in this direction.

Operation of Wood Mills

The introduction of central-station energy into wood-working plants has often proved difficult and is a subject of much discussion. It may therefore be noted that a large stave mill at Galveston, Tex., which formerly burned its refuse in its own 100-hp isolated steam plant, is now operated by 40 hp in electric motors using central-station service. This motor drive costs the mill $60 to $65 a month at 4 cents per kw-hour, while it sells the refuse formerly burned to the local gas company for $1.15 per ton delivered, or about $150 per month. The gas company utilizes the oak shavings and refuse for fuel in its water-gas plant, replacing oil that formerly cost $400 to $500 a month. A ton of the oak fuel, reports Mr. F. M. Lege, manager of the local company, is equivalent to about 4 barrels of oil. Special furnace settings had to be designed to burn the wood to the best advantage, but the existing boiler equipment was converted for the purpose at very slight cost. The wood mill finds the new arrangement very satisfactory, as it saves both cost and labor, and the gas company has been able to cut its fuel cost considerably. The figures above given for the stave mill's saving do not adequately represent the entire economy gained by the customer, for he has since added several machines. Several other wood-mill customers of the Brush Electric Light and Power Company, of Galveston, also report substantial savings in replacing steam by electric power. One such mill, which formerly burned all its refuse besides $100 worth of coal per month, now pays $80 a month for electric service to its 100 hp in motors, sells its by-products for $100 and saves the entire cost of its coal, netting an economy of about $120 a month.

Electric Conveyors for Fruit

It has long been evident that one of the seriously neglected fields of central-station work is that of operating docks, piers and railway freight yards, most managers not being aware, apparently, that practical "telpherage" systems and other devices are in successful use whereby package freight, and even bulk material, are handled successfully; thus opening up an enormous demand for apparatus and energy. As an example, the fact may be cited that at New Orleans and Mobile, the United Fruit Company makes use of motor-driven machines of the marine-leg type for unloading the bunches of bananas from the holds of vessels, thus saving much time loss, labor and damage in comparison with hand unloading. On some other docks, as noted in previous reports, the overhead telpherage system, as on the New York river fronts, has found adoption.

At the two Southern ports named, from an extension boom projecting over the water's edge a 35-ft. vertical marine leg is dropped into the hatch of the vessel drawn up to the wharf. Sprocket wheels on the marine leg and stationary portions of the unloader carry a pair of chains 4 ft. apart, between which, on cross-bars, is attached a canvas strip so arranged with slack as to form pockets at 3-ft. intervals. The four machines at New

Orleans have ninety-two-pocket belts and each is driven by its own 15-hp induction motor. These machines have individual equipments for unloading 2500 bunches of bananas per hour, the bunches weighing from 60-lb. to 120 lb. each. In the hold of the vessel the conveyors are filled from three levels, each level loading into every third pocket of the conveyor, the speed of which is, of course, too high to permit filling successive pockets from a single position. After reaching the back or dock end of the conveyor the pocket-chain passes over a flat roller which gently discharges the bananas onto a moving belt running back to the cars where the fruit is loaded for shipment by rail.

At New Orleans the Mississippi River level varies periodically by about 14 ft., and the unloaders must accommodate this variation as well as be able to reach the hatches of any ordinary vessel. The suspended marine leg is supported from an auxiliary boom hinged to the main boom, so that by making a jack-knife bend, practically any hatch level or distance from the wharf can be negotiated. The manipulation of the booms and hoists and the side travel of the huge machine along the dock front are all controlled by friction clutches on the main conveyor-motor shaft. Within three to five minutes after the vessel's hatches are made ready, the machines can be located in position and unloading begun. The four machines at New Orleans working together can unload 10,000 bunches per hour. Besides expediting the work of unloading and saving labor, the machines effect their most important economy in preventing damage to the fruit. Energy to operate the unloaders at New Orleans is taken through cables and plug connections on the dock from the lines of the New Orleans Railway and Light Company. The machines at Mobile are supplied with energy by the Mobile Electric Company.

The Trackless Trolley

An entirely new department of business for central stations is the trackless trolley, operating on suburban roads or in rural districts where it is undesirable or unprofitable to install tracks; so that the opportunity ignored by trolley systems falls as naturally to the central stations as does the charging of electric automobiles, some of which might, of course, do the same work. The trackless trolley, with contact wires overhead, has already been adopted at numerous places in Europe, and there are hundreds of communities in America that could be benefited by such a service; the central station at the same time picking up a nice, steady, off-peak load, and having quite frequently, already in use, the pole lines to which the circuits can be attached, or else securing in this new field an additional use that will warrant the erection of such a line. The subject is already receiving very serious attention, and many such installations may be looked for in the near future.

GENERAL RELATIONS WITH THE CUSTOMER

Elsewhere in this Report is a discussion of various topics in regard to the relations of the central station with the general public. There remains a department of equal and special interest, that of the relations with the actual customer, and each year many items of fresh interest claim attention. It is believed that the reports in the Commercial Section will embody a large amount of unusually valuable data of this character, but there are a few that may be noted in a report like this devoted to a review of the art and industry as a whole.

Number of Customers

One of the questions that is most frequently addressed to the Association office, as well as to the Census Office in Washington, is as to the number of customers in given localities, or in the whole country, or what the percentage of the population included in the service may be. The question is asked for purposes of comparison, or guidance in putting a new article on the market, but is most difficult to answer, while the inferences drawn are often likely to be misleading because of uncertainty as to the actual areas or actual population considered. Thus there are half a dozen statistical Londons or Berlins, four or five New Yorks and Chicagos, two or three Washingtons, and so forth; besides all of which underlying conditions are very different. Figures given heretofore in this Report show that the new districts and cities of the West give by far the largest electrical earnings per capita or customers per community, but this is not surprising. When the chairman of the present Committee visited Vancouver last September, there were over 28,000 meters in use in an area containing not quite 150,000, and such "saturation" seems phenomenal and almost unbelievable when mentioned in the older parts of the country. Yet several of the suburbs of Chicago supplied with electrical energy by the Public Service Company of Northern Illinois have rather exceptional records in the proportion of consumers to total population. In La Grange, with a population of 5282, the company has 1108 meters installed, while in Oak Park, with 19,440 inhabitants, there are 5022 customers' meters in service. Park Ridge, a considerably smaller suburb, has 2009 inhabitants and 512 meters, but the best showing of all is presented at Flossmoor, a high-class residential suburb south of the center of the city. Here there are thirty-five houses and thirty-five meters, every householder being a customer of the company. When we all reach that degree of "occupancy" of the territory, our output, income and consumption of apparatus will be slightly different from what it is now. Oklahoma City with a population last year of 75,000, had 17,000 consumers supplied by the Gas and Electric Company, 80 per cent being residence customers. Out of 700 houses in Sabetha, Kan., 600 have electric light, and exhaust steam heat is furnished to 500. The Union Electric Light, Heat and Power Company of Fargo, N. D., has one electric customer to every 5.33 inhabitants. As to "saturation" with apparatus, over 90 per cent of the customers at Colorado Springs have electric irons.

Wiring Campaigns and the Contractor

Almost every progressive company has a wiring campaign of some kind or another going on, and practise certainly varies very widely. The relations with the contractor press all the time for friendly settlement, and the intense interest taken in this branch of the subject was strikingly manifested at the recent March meeting of the New England Section, when President Sands had all he could do to apply "closure" to the discussion of the question. Mr. C. R. Hayes, of the Fitchburg Gas and Electric Company, presented a forceful paper on the matter, claiming that if the central station is content to take on merely the business that comes to it it can grow only slowly. The policy must be one with initiative, with close co-operation between the contractors and the operating companies. He favored leaving all construction work outside the company's own system to the contractor, keeping the electricity supply organization out of the wiring business and allowing the contractor to act as an intermediary in the process of connecting the customers' circuits to the lines. As the desire to obtain electric service precedes the necessity for electric wiring, it should bear the expense of practically all solicitation for new business. If the contractor will take on work, not at a loss, but at a small margin of profit, the larger field opened up will in itself offer greater opportunities. Mr. Hayes contended that the profit on appliances should be maintained so that the contractor will receive at least a fair return upon his sales. On motors the profit is not of much importance, but too low a price on flatirons prejudices the customer against the company. The central station should sell tungsten lamps only to its regular customers. Little would be gained by holding back the low-candle-power tungsten lamp. Electric lighting to be popular must be cheap, and it would then be used more generally with a greater net profit to the company.

In the very animated discussion, Mr. E. M. Addis, Brattleboro, Vt., said that in small towns it is often necessary for the central station to support a low-price house-wiring campaign in order to secure the business. In his case the company's rates were reduced one-third and the plant equipment increased 100 per cent, and yet the business barely held its own until the company started a house-wiring campaign, installing complete equipment in cottages for from $20 to $30 each. A premium of $1.50 was given to each employee securing a $30 contract and a smaller premium for each lower-priced installation. One line foreman received $21 in premiums for this work, and the company added 140 residences to its connected load in 1911 without spending over $100 in the way of equipment extensions. Mr. F. L. Ball, Haverhill, Mass., emphasized the necessity of specializing in order to obtain new business, as in house-wiring campaigns. Reflectors and other material needed standardization. He cited difficulties in the way of making arrangements with a large number of contractors. Mr. A. F. Townsend, Woonsocket, R. I., favored leaving wiring to the contractors, except in rare instances. He felt that customers regard the central station more highly when the latter keeps out of the contractor's field. Where central stations do wiring the payment of bills is slower and the public expects too much.

Mr. H. G. Lendrim, president of the Providence (R. I.) Contractors' Association, in strong terms condemned low-price wiring campaigns, with special reference to city conditions. On account of the labor conditions in cities he could not conceive of installing seven outlets complete in a cottage house for $20, with good material and workmanship. He paid journeymen $3.28 per day of eight hours and helpers $2.19, and under present conditions could not therefore agree with those who favored low-price campaigns.

Mr. R. W. Rollins, Worcester, Mass., said that in his experience at Hartford it was generally the case that a large number of outlets were specified by the customer, the outlets above the minimum being billed at a price of $3 each, which usually brought the expense to about $50. Mr. J. P. Coghlin, a Worcester (Mass.) contractor, pointed out that the labor problem controls in large cities. Less than half the work is done to-day for the same cost by a union journeyman and helper than a good man turned out fifteen years ago. On many of these thirty-five-dollar wiring jobs no overhead charge was included, and often no expense except the labor was counted. The central station had no better employee than the active contractor, who drew nothing from the company pay-roll. Mr. W. B. Schwabe, Windsor Locks, Conn., said that the low-priced wiring campaign is absolutely essential to the customer of small means and he advocated instalment methods of payment. Mr. L. D. Gibbs, Boston, contended that there is no use trying to give people something in order to stimulate electric service. The point is to see that the contractor comes out of the affair all right and to charge the deficit, if any, to the advertising account, where it belongs. Every successful wiring contractor is a salesman or employs one. Contractors should be treated as parts of the central-station world, and every possible assistance be given to them. More time spent with the contractor while an office boy at $6 a week attends to unimportant matters would pay handsomely.

Doubtless, from a consideration of many of these points and others, the Cleveland, O., Electric Illuminating Company last year removed all of its solicitors from the work of securing house-wiring contracts, turning this over to the contractors of the city, who are offered a bonus of 10 per cent on all wiring jobs in houses on the company's lines. The minimum bonus the company will pay is $5.00 and the maximum $10 per house. The same offer of reward will be generally made to any person who secures house-wiring contracts, provided he secures the wiring of at least five houses, such an outsider not being paid, however, until he has turned in his fifth contract. This provision is designed to prevent owners or tenants collecting bonuses on their own houses. When an outsider obtains the contract the wiring contractor, of course, receives no bonus, but has his usual profit under the unit system of computing wiring costs specified by the Cleveland company. All employees of the illuminating company are excluded from the bonus award, but may receive $1.00 commission for service-connection contracts brought in by them. Under the new agreement thirty-six contractors in the city share in the distribution of house-wiring work.

The cost of wiring was reduced 15 per cent below the former Cleveland unit scale (previously printed in this Report) on all outlets in excess of the first ten. As before, the wiring contractor allows ten months for the payment of the wiring cost, although the illuminating company does not enter into this transaction. Where the newly wired house is on the company's distribution lines, 15 per cent of the wiring-schedule cost is credited on the customer's future lighting bills as before.

In Brooklyn, N. Y., last summer, the Edison Electric Illuminating Company made a proposal to contractors, extending from July 15, for two months, whereby it agreed to give a wiring job, secured by its new installation bureau on a house already built, to any Brooklyn electrical contractor who secures for himself the wiring of a house already built and along the line of the company's mains. Thus every time a contractor independently secured such a job the Edison company awarded him a similar job secured by its own staff.

According to Mr. J. T. Marron, contractor, Rock Island, Ill., wiring construction aggregating in value $10,000,000 is done each year in the United States. Of this $10,000,000 worth of construction, about $2,000,000 is done by curbstone wiremen, $1,500,000 by the owners themselves, and the rest by the established professional electrical contractors. Over half of this last work, Mr. Marron claims, the contractors carry out at a price below the cost, when the items of labor and legitimate overhead expense are figured in. Thus 70 per cent of the electrical work done in this country each year is without profit to the contractor.

Other Wiring Methods

Last year, the Empire Electric Company, of Joplin, Mo., Webb City, Mo., and Galena, Kan., offered to wire old houses at a price about 35 per cent below what was found to be the usual cost of such work. For $17.75 the company offered to furnish and install, complete, wiring, fixtures and tungsten lamps for a house of five rooms as follows: Living-room, one two-lamp fixture; dining-room, one two-lamp fixture; bedroom, kitchen, bath-room and porch, one lamp each. The price, $17.75, may be paid $2.75 down, followed by twelve monthly payments of $1.25 each. The company's rates for residence service are 8 cents per kw-hour for the first 25 kw-hours and 5 cents thereafter.

The house-wiring campaign began June 1 and was planned to close October 1. Out of the total population affected by the offer, 35,000 people, an average of 75 old houses per month have been contracted for wiring. With each house wired an electric iron was placed for thirty days' free trial, most of these iron installations becoming *bona fide* purchases at the expiration of the month. A number of electric toasters were also installed. The fixtures furnished with the $17.75 wiring offer are of simple but good design and the customer is furnished with 40-watt or 60-watt lamps, as he chooses, but may have larger lamps by paying a small excess. None of the tungsten lamps are, of course, exchangeable after the first filling.

With 15,000 houses already wired the Omaha Electric Light and Power Company is taking on additional old houses at the rate of 1200 a year. Within the last few years the lowest number connected, according to Mr. I. B. Zimman, contract agent, has been 938, and in 1910 1257 old houses were wired. It was confidently expected that 1911 would exceed 1300 houses connected.

The Omaha company does no wiring, leaving all such work in the hands of local contractors who are called in for competitive bids. To each solicitor obtaining a house-wiring contract, however, a bonus of $1.50 is awarded, and this stimulus is believed to cause the unusual house-wiring interest noted in Omaha. The solicitors are already well paid by salaries, but the bonus is in the nature of an extra perquisite which they work energetically to earn.

Following an excellent practise already noted, the Marion (Ind.) Light and Heating Company offers owners its assistance in finding tenants for electrically wired houses temporarily vacant. The company has erected an electrically lighted bulletin board at the side of its office on one of the prominent streets of Marion, where announcements of wired houses are posted at the request of the owners. The following is copied from the signboard:

MARION LIGHT AND HEATING COMPANY'S RENTAL BULLETINS

The following houses for rent are wired for electric conveniences:

ROOMS.	LOCATION.	RENT.	AGENT.

The only drawback to the usefulness of the plan to prospective tenants in search of quarters is the fact that no electrically equipped house remains posted long on the bulletin board before it is snapped up.

A large Western central-station company last year furnished each of seventeen local real-estate agents with 100 label tags for house-renting keys. One side of the tag was blank for the address, and the reverse bore the legend, "When you are ready for electric light and power, telephone .... Electric Company, ..." The card presented a reminder to the newly settled householder, informing him whom to call up to have service turned on or his house wired. The real-estate men were much pleased with the tags, and the electric-service company's office was soon deluged with additional requests after the first lot was sent out.

Interesting and Instructing Customers

Up to about the end of 1911, the Rockford (Ill.) Electric Company had about fifty flat-rate controllers in use, although a larger number have been installed and later converted to metered business at the request of the customers. In its flat-rate service compaign the company has offered four 20-cp tungsten lamps for $1.00 per month, five for $1.25 and six for $1.50. No provision is made for connecting up heating appliances under this schedule or for cutting out the controller in case the customer desires to use all his lamps on some special occasion. The service is restricted purely to the lighting specified, and as the minimum flat rate, as well as the most popular, is $1.00 monthly, many such customers have preferred to be changed to service under the meter minimum of 50 cents a month. The controllers in service have been subjected to regular inspections at intervals of one or two months during periods when the work of the meter department is light. During its wiring campaign the Rockford company has been offering to wire a six-room house with porch and bath for $18. It will also furnish fixtures as follows: Parlor, three-lamp ceiling fixture, $2.75; dining-room, two-lamp, $2.25; kitchen, pendant, $1.00; bedrooms, two-lamp pendants, $2.00; bathroom, bracket, 80 cents; porch, 65 cents; hanging and connecting fixtures, $28.45.

Quite recently the Louisville Lighting Company, of Louisville, Ky., having found that business was sometimes very slow in coming from vacant houses which had previously been equipped with meters, adopted the expedient of attaching a pasteboard tag to a wire or pipe where it would be easily noticed in the event of the new tenant coming to look the situation over. The tag contains a detachable post-card for mail communication with the lighting headquarters. One side of the card says: "Electric light and power in this building furnished by the Louisville Lighting Company. Telephone contract department. Both 'phones. If you want service tear off this post card and mail, signing your name and address." The other side of the card is directed to the lighting company and contains a blank space for remarks or requests for information from headquarters. The cards have been found of distinct value in hastening business which might otherwise be slow in coming. Some lighting companies post a placard near the place of the meter, but the mailing card, which originated with Mr. J. J. Leverone, of the company, is considered much more effective. A similar plan is an arrangement with all of the realty men in the city whereby advertising cards from the lighting company are attached to all keys issued from the real-estate offices to prospective tenants of vacant property.

The Public Service Electric Company of New Jersey has prepared several 4½-in. by 5-in. stickers reproducing in brilliant colors interior views of its Newark apparatus display-rooms, which are attached to customers' bills for the purpose of creating an interest in the company's appliance exhibit. The views reproduced include the main show-room, electric-lamp section, basement showroom and entrance doorway. The company's offices are handsomely fitted up in white marble with bronze fixtures and trimmings, and the illustrations by the four-color process make a striking appearance which serves to attract many customers to the central-station offices.

The Kentucky Electric Company maintains only a business office at its building in Louisville, but arranged last year an appliance display window in a new department store on the principal shopping street of the city. The central-station company obtained this window space as well as a demonstration counter within the store rent free from the store owner, who gets his return from the presence of persons attracted into his establishment by the electrical demonstrations, and has willingly given up the largest part of one of his two show windows for this purpose. Electric heating and cooking appliances, fans, etc., are shown in the street window, and practical demonstrations of their use are given at the counter inside. The central-station company has its own service lines for its exhibit, but makes no payment to the department store for the space occupied. Invitations to visit the demonstration are run in the display-advertising columns of the local newspapers and have done much to popularize the new store. The Kentucky company has the services of a capable demonstrator who is qualified to discuss electric-appliance advantages with the people who use such conveniences. From her own experience and that of friends who have used certain devices this demonstrator is able to discuss the practical possibilities of the apparatus, explaining, for example, how an entire chicken dinner can be cooked on a 500-watt toaster stove, and give other points that instil confidence in the use of the apparatus into her women customers. All this leads to new business.

Last year the Denver Gas and Electric Light Company put through what it called a "canvass of customers." Representatives visited every consumer and inquired if the service was satisfactory. Permission was also asked, regardless of the answer to the first question, to make an inspection of the gas and electric appliances of the household. The men were prepared to make certain small adjustments and repairs, and also took orders for appliances, but did not specifically urge their sale. In this case the inspection described resulted in a great deal of good. It proved to the customer that the company really wanted to know about the service its patrons were getting. The minor adjustments effected promoted satisfactory service and in many cases the use of more service by the customer. Many instances were found where, for some trivial reason, appliances were not used. In such cases fifteen or twenty minutes spent in adjustment, demonstration, etc., by an inspector removed all the difficulty and transformed a casual user into a good consumer.

It will be remembered that Mr. Strickrodt described in a paper before the Association a somewhat similar plan carried out successfully by the Schenectady Illuminating Company. In the Denver case, the work was done with the co-operation and under the direction of the city electrician. It may be noted as significant that accidents and claims have been greatly reduced.

Free Fan Service for the Sick

At the New York Convention last year, considerable attention was attracted to the idea of supplying the sick with free-fan service, which originated with Mr. R. M. Searle, of the Rochester Railway and Light Company, and which has now spread with remarkable rapidity all over the country. It was stated in the electrical press that by July, 1911, the plan slightly modified, had been put into effect in fifty-five or more communities in the South, North and West supplied with energy from the public-service companies in the Byllesby group; in Stockton, Cal., and in a number of other places. Newspapers, to which such an attitude on the part of public-service corporations was a revelation, commented favorably on the plan, and it is certain that the value of the advertising thus received more than compensates for the cost of the service gratuitously given.

The same idea was carried out this winter in Chicago, during the tremendously cold weather, by the Commonwealth Edison Company, in loaning freely, on telephonic request, its "Pulmotor" to be used in cases of gas asphyxiation. The device was thus useful in saving life in several instances and again the newspapers were loud in their praise of such public spirit. Somewhat analogous is the work done by many companies in giving, practically free, the use of their apparatus to thaw out the water pipes of customers appealing to them for help in sub-zero emergencies. Only a small charge was made to cover incidental expenses, and the saving to the customer, and the convenience, were in most cases beyond price.

Handsome Office Buildings

The increasing practise of central-station companies in taking part of what is really the balance available for dividends and spending it in handsome office buildings which are a distinct ornament to the city, and a source of convenience to the customer and all doing business with the corporation, is much to be commended. It is one further evidence of the higher ideals of public service that now animate not merely individuals and groups of men, but public utility systems as a whole. Two striking new examples may be cited. One is the office building of the United Electric Light Company of Springfield, Mass., opened just prior to the March convention there of the New England Section. It is a fine structure of classic design, and might easily be described as the most beautiful building in a comely city. It is not simply an office for the employees, but an attractive resort for customers and citizens, who are welcome there at all times, and for whose convenience many details have been worked out. It may also be mentioned, as one detail, that all the larger lighting fixtures are of carved alabaster, and that the lantern of the central electrolier hanging in the rotunda was carved at Florence from the largest and finest block of alabaster ever imported into the United States. President Gilchrist, at the annual dinner, commended the building heartily as a fine example of public spirit shown in helping to create the "city beautiful."

The other notable instance is the fine office and customers building that is being erected by our veteran Past President, Mr. C. R. Huntley, for the Buffalo General Electric Company, over whose destinies he has presided so long. This building of pure white granite and terra cotta will soon be opened to the public. It rises 300 feet in height, and is the tallest in the city. Its lofty tower, with three upper stages, will dominate the landscape, and will be thrown into high relief nightly by inverted lighting, while at the top of the tower three large searchlights will revolve. The top floor of the building will be a meeting room for the employees of the company, while the basement will be a fine display room for the public. Here again is the note struck of pride in the city and in its beauty, attractiveness and growth. If a central-station company is not interested in the prosperity of a community, who can be? One answer to this question is found in the many "slogans" that have been put "on the map," due chiefly to the energy and enterprise of our member companies, and proclaiming with all the force and charm of electric illumination that here is opportunity for all, on this spot.

RELATIONS WITH EMPLOYEES

The report of the Public Policy Committee will deal with many topics under this head, and there is no need to repeat or recapitulate what will be covered in that important document. Hence, only a few topics are touched upon here that are not likely to be included in a report which is planned each year to cover a limited and specific range of vital subjects. For example, we have the competitions instituted by some of our Company Sections, in which the successful members enjoy a "tour de luxe," with all expenses paid, to the Seattle Convention, the parent company enabling the carrying out of this generous system.

Resuscitation from Shock

On February 22, 1912, a date of happy omen, the first meeting of the Commission on Resuscitation from Electric Shock was held at the Association offices in New York. This commission was recently organized upon the initiative of the National Electric Light Association, and has for its purpose the study of electric shock and the preparation of a set of rules for first aid in case of electrical accident. The commission is composed of members of the American Medical Association, National Electric Light Association and American Institute of Electrical Engineers, as follows: *Nominated by the American Medical Association:* Dr. W. B. Cannon, professor of physiology, Harvard University, Chairman; Dr. George W. Crile, professor of surgery, Western Reserve University; Dr. Yandell Henderson, professor of physiology, Yale University; Dr. S. J. Meltzer, Rockefeller Institute for Medical Research, New York; Mr. W. D. Weaver, secretary. *Nominated by National Electric Light Association:* Dr. E. A. Spitzka, professor of general anatomy, Jefferson Medical College; Mr. W. C. L. Eglin, electrical engineer, Philadelphia Electric Company. *Nominated by American Institute of Electrical Engineers:* Dr. Elihu Thomson, electrician, General Electric Company; Dr. A. E. Kennelly, professor of electrical engineering, Harvard University.

At this meeting the medical members of the commission advocated unanimously the Schaefer, or prone, method as the best means in the hands of laymen for maintaining respiration in victims of electric shock, and the commission voted formally to recommend this method. According to the Schaefer method, the patient is placed face downward, whereas according to the Sylvester method, which has heretofore been most used for artificial respiration, the patient is placed face upward. A chart is now being prepared which will give details of first aid in cases of electric accidents and will describe fully the method of applying artificial respiration. This chart will be issued under the auspices of the National Electric Light Association.

An Indemnity Exchange

An indemnity exchange system has been worked out by the public utilities in St. Louis that is of interest to member companies. Operators becoming members pay into the exchange the sums they would otherwise pay as premiums to liability insurance companies. Thirty per cent of these sums are then in turn payable to the Utilities Service Company, a corporation organized to manage the exchange, to cover management expenses. The remaining 70 per cent is placed with trust companies under depositary agreements for the payment of losses and loss expenses. Out of the 30 per cent payable for management expenses, all of the expenses of the exchange are borne, including the maintenance of an adjusting department which handles the investigation of accidents and the adjustment of losses and an inspection department for improving conditions at the plants of subscribers, to reduce losses and to promote economy and efficiency of operation. A service of value is also rendered free in the form of consultations or correspondence with a firm of consulting mechanical and electrical engineers. Operators who may want to make inquiry regarding fuel economies, the purchase of new equipment and similar matters can thus secure without cost information which ordinarily involves considerable expense and trouble.

By the terms of the contract, the operator may, if he desires, personally settle injury claims made upon him, subject to certain limitations. This enables him to take into consideration the relations existing between the injured party and himself and to make settlement without regard to the legal phase of the matter. The operator is given the benefit of suggestions in this respect, and care is taken that he does not exercise undue liberality; but the experience has been that the operator treats this privilege wisely, and the result in dollars and cents is, on the whole, a reduction in the amount of the claims. At the expiration of the term of the policy a pro rata fraction of the amount remaining on deposit is returned to the subscriber. Honest claimants are directly benefited.

Some Chicago Methods

A comprehensive "Employees' Handbook" has been issued by the Commonwealth Edison Company of Chicago. Its purpose is to acquaint the 3000 employees with the company's policies and to enable them to adapt themselves to the spirit of the organization. The ideal of the company is expressed as "courtesy to the public and the best possible service." It is shown how this ideal is attainable. The policy of the company toward its employees is explained, and the employees' saving fund, merit system, the company library, public library station, Commonwealth Edison Section of the National Electric Light Association, night-school scholarships, rewards for suggestions and other aspects of that policy are dealt with. The book also includes general information about the company, including the rates charged for electricity and a list of other handbooks issued by the company. These other handbooks relate to (1) the general characteristics of the company's service, (2) electric vehicles, (3) wiring regulations, (4) the proper use of the telephone, and (5) an emergency directory more particularly for the use of employees in the operating departments. The "Employees' Handbook" makes a pamphlet of twenty-nine pages.

A recently established feature of the welfare work of the Commonwealth Edison Company, is the visiting-nurse service. All absentees are reported promptly to the employment bureau and a registered visiting nurse, employed especially for the purpose, is sent to the residence of the absent employee on the same day. Advice or temporary professional assistance is given where needed, although the nurse cannot remain in attendance on any case of illness. The nurse turns in reports each morning on the calls of the previous day and these are forwarded to the heads of departments by the employment bureau.

Educational Work

On December 27 the New York Edison Company opened a school and lecture course for employees at their building 44 West Twenty-seventh street, New York City. This is a new departure in the electrical industry, being the first of its kind, and is the result of the company's policy to train and educate its employees to high standards of efficiency. The idea originated with Mr. Arthur Williams, who had long desired to have some sort of an arrangement whereby employees might be trained by the company, while in its employ, along the lines of their work. To Mr. F. C. Henderschott, however, is due the credit for bringing the plans into shape. For some nine months Mr. Henderschott worked on the school idea, visiting all the large industrial schools, getting facts here and there, and blending all to get the best results for an education of this kind.

The school consists of four courses, which are formed to meet the requirements of the different classes of employees. Course I is conducted by E. G. Grandstaff, the general instructor of the school, and is based on the company's Solicitors' Handbook and the National Electric Light Association Solicitors' Handbook. Tours of inspection are made, taking in the large Waterside stations, typical substations, and the meter-testing laboratories, followed by discussions of the basic principles of electricity and the practical utilization of information gained. The school session following each lecture has been devoted to written and oral examinations. All employees who are preparing for positions as inspectors, agents and solicitors, and those inspectors, agents and solicitors who are in need of such instruction, are included in the class. To make the instruction more personal the course was divided into several sections, meeting on different days, but receiving the same instruction. There were approximately three sessions a week, all on the company's time, from 4.00 to 5.30 p. m.

Course II includes the study of Hygiene, Health and Recreation, and their application to right living and right thinking. Lectures have been given by Dr. John Woodman, the company's physician, on "First Aid to the Injured" and kindred subjects. Dr. Luther Halsey Gulick and Dr. Winthrop Talbot, of Cleveland, who are among the most noted hygienic authorities, have also spoken on subjects connected with the course. Examinations, both oral and written, have been held after each lecture by the instructor. These school sessions took place weekly, and embraced all students enrolled in the school, and all other employees who can be spared from their duties.

Course III has been a study of the Basic Principles of Salesmanship, and Their Relation to Business Building, and consisted of a number of talks by prominent men, such as Walter Dill Scott, of the North Western University; John D. Kenyon, vice-president of the Sheldon School of Salesmanship; Don C. Seitz, business manager of the *New York World;* Dr. Lee Galloway, of New York University; C. Rolland Hall, advertising manager of the International Correspondence Schools, and Harrington Emerson, efficiency engineer. This course included all the students in Course I, with the addition of all those who attend such instruction. Every alternate session has been devoted to discussions, examinations and sales demonstrations under the general instructor's direction. These talks coming as they do from such men have been of inestimable value to both the new and old salesmen, bringing them in touch with the most modern ways of handling business.

Course IV has consisted of an investigation of the Scope, Policies and Organization of The New York Edison Company, as explained in a number of lectures by the heads of the various departments. This course has gone extensively into details, and much pains have been taken to inform students of the different phases of Edison work and to instil in the new employees at the outset an understanding of the plan and policy adopted by the company in the course of all work. Examinations and discussions have been held alternately with the lectures, as in the other courses, and records kept of the progress of the scholars, both as a body and as individuals.

A great deal of attention has been given to the records of each student, complete information as to education, experience, etc., prior to engagement with the Edison Company, and a detailed record of progress in the school has been kept. Personality, habits, appearance and characteristics have also been noted, and any one needing it has been given special instruction. Managers and heads of departments are kept informed of the progress of students under their bureaus, and are thus in closer touch with their subordinates than formerly. To those completing the course with credit a certificate will be given, and to those of especial excellence prizes will be awarded. The above description is, of course, somewhat anticipatory and superficial, as the work was actually in its earlier stages when these notes in regard to it were compiled from the Company Section *Bulletin,* which month by month has recorded the development and progress of this scheme of instruction.

THE PRESIDENT: I have no report from the chairman of the Library Committee, and I have also no report from the chairman of the Committee on Hand Books. Therefore, Mr. E. A. Edkins, of Chicago, will now give his report on the *Question Box.*

REPORT ON THE QUESTION BOX

In presenting their report on the work of the preceding year, the Editor desires to draw attention to the fact that although only five volumes of the *Question Box* have been published in the *Bulletin*, this report marks the completion of a decade of *Question Box* service, as it also marks the passing of the old system of gratuitous editorial management. At this juncture, when the *Question Box* is on the eve of being permanently located at the Association's headquarters under the supervision of a salaried editorial staff, it may be interesting to review very briefly the extraordinary development that has taken place in this useful branch of the Association's activities during the last ten years.

In an address delivered by Mr. Henry L. Doherty, then President of the Association, at the Twenty-fifth Convention, held in Cincinnati in 1902, a suggestion was offered which contained the germ of the *Question Box* idea and which resulted in the presentation and discussion of a number of questions at the last session of that Convention. Shortly thereafter, Mr. H. T. Hartman was appointed as first editor of the *Question Box*, and his first report appeared as an appendix to the Proceedings of the Convention held in Chicago in 1903. The subsequent development of the *Question Box* is shown in the subjoined tabulation:

Editor	Years	Questions	Answers	Total
	1901- 2	71	303	374
H. T. Hartman..........	1902- 3	193	682	875
H. T. Hartman..........	1903- 4	424	2,178	2,602
H. E. Niesz............	1904- 5	545	3,057	3,602
P. Lüpke	1905- 6	616	2,600	3,216
P. Lüpke	1906- 7	494	1,581	2,075
A. J. Campbell.........	1907- 8	209	379	588
A. J. Campbell.........	1908- 9	275	472	747
J. C. Parker............	1909-10	385	744	1,129
M. S. Seelman, Jr.......	1910-11	396	1,693	2,089
E. A. Edkins............	1911-12	350	1,500	1,850
	Total	3,958	15,189	19,147

These figures would seem to indicate a remarkable growth during the period from 1903 to 1907. It was during this period that the *Question Box* was issued as an annual volume, and the large number of questions and answers published each year may have been due to the methods used in securing these contributions, or to the indulgent policy of the editors, or to the character of the contributions. In those days it was the custom to circularize the member companies for questions; these questions after having been received and classified, were made up in printed lists and sent out with the request that as many of the questions as possible be answered by each member. A brief glance through some of the early volumes reveals an astonishing number of trivial replies. For example, the *Question Box* for 1905 includes over 1200 answers, each occupying not more than one line of type; about 150 of these answers being either "yes" or "no"! This accounts in some measure for the excessive number of questions and answers published during the above-mentioned period. In the figures given for the current year the questions and answers for the last three months are estimated.

Starting as an annual compilation of interesting problems for presentation and discussion at the yearly Conventions of the Association, the *Question Box* outgrew its original scope in a few years. Upon the recommendation of Mr. Paul Lüpke, the first scheme was abandoned in 1907 and the *Question Box* was issued in the form of a monthly bulletin. During the last three years the demands upon the *Question Box* have become so varied and extensive that the need for permanent editorial management and proper facilities for quickly gathering and distributing information on all matters concerning the industry have finally resulted in the engagement of a permanent editor. In turning over the work to their successor, the present Editors desire to offer the following recommendations:

REVISION OF CLASSIFICATION

Coming down from a long line of busy men whose voluntary editorial services naturally had to be subordinated to the more exacting affairs of their business, the *Question Box* Classification represents the hurried and unscientific tinkering of many hands. In the early days a simple topical index was used, and was quite sufficient for the purpose. The volume and variety of contributions, however, has increased to such an extent that the usefulness of the *Question Box* as a practical reference work is in danger of being impaired, unless steps are taken at once to place the classification on a scientific library basis, commensurate with the bulk, scope and importance of the subjects treated. Practically all of the up-to-date libraries in this country, including all of the big technical libraries, now use the Dewey Decimal Catalog System. In various modified forms the decimal scheme is used by such large engineering concerns as the H. M. Byllesby Company and Stone and Webster, by a number of railroad systems, and on all of their new work by the libraries in many of the large European capitals; it has also been adopted by the big International Bibliographical Institute in Zürich. Within the limited space of this report it would be inexpedient for the Editors to attempt a description of the Dewey decimal system, but in general it may be said to embody the concentrated knowledge and experience of the best library experts in the world. It is chiefly notable for its logical correlation of allied subjects, its simplicity and adaptability to particular requirements, and the remarkable facility with which interpolations and expansions can be made without deranging the original order and continuity of the classification. Some time ago Professor L. Breckenridge, now of Yale, and Professor G. E. Goodenough, of the University of Illinois, got out an extension of the Dewey decimal system of classification applied to the engineering industries. This extension has since been incorporated in Mr. Melvil Dewey's revised Decimal Classification and Relative Index, issued in 1911, and in modified form could very easily be adapted to the use of the *Question Box*. In an appendix to this report the Editors have outlined a tentative classification scheme; this scheme is presented in a skeletonized form only, as there is no desire to do more than suggest the general principles under which such a classification should be constructed. The order in which the class or divisional numbers are assigned is wholly a matter of opinion, and the question of whether we should begin with Management or Engineering is not particularly important. The vital point is that we should without further delay adopt a flexible and properly correlated classification and index scheme that is in accord with the best methods of recognized authorities on the catalogic art. And having adopted such a scheme it is equally important that it should be applied to the next edition of the *Question Box Revision*.

ANNUAL QUESTION BOX INDEX

One of the most burdensome tasks that the past editors of the *Question Box* have had to struggle with is the compilation of the Annual Index. As the volume ends in July and the Index must be published with the first issue of the new volume, usually out in September, the brunt of this work always falls during the hot summer months of July and August, and no one who has not undertaken the task can quite realize or appreciate how difficult and irksome it is. The present Editors have endeavored to minimize this unpleasant feature of the work and equalize it over the entire year by establishing a card index system whereby each number of the *Question Box* is indexed as soon as it is published, so that when the last number of the volume issues from the press the work of preparing the Index for publication will be a comparatively easy task. The Editors recommend that this system of indexing be continued.

DIRECT-BY-MAIL SERVICE

The Editors have made a point of acknowledging every communication as soon as it is received and of furnishing copies of answers to the querist, whenever necessary, in advance of publication. In many emergency cases when information was required at the earliest possible moment, the data have been collected and forwarded within 24 hours after the receipt of the request. It is believed that this extension of the monthly *Question Box* service to meet the needs of those who require information in a hurry has proven very popular, and it is therefore recommended that this feature be elaborated and made a part of the regular policy of the *Question Box*.

STAFF CORRESPONDENTS

During the last year arrangements have been perfected with the Chairmen and Secretaries of the principal Sections and Geographical Divisions of the Association, by which questions which are referred to them for special attention are in turn sent out to members in their territory, the answers being returned to the local Chairman or Secretary and by him transmitted to the Editor of the *Question Box*. This plan has been found effective in subdividing the work where it is necessary to circularize a large number of member companies; it also has the added advantage of enlisting the personal influence of the executive officers of the various Sections on behalf of the *Question Box*. It is believed that the efficiency of the service may be greatly increased by developing this plan to a point where the *Question Box* will have an official correspondent in every Class A company in the Association.

CONDENSATION OF CONTRIBUTED MATTER

The occasional verbosity of the *Question Box* in past years has been due largely to the fact that the Editors have not had time to boil down and thoroughly condense the copy sent in by some of their contributors. Now that a permanent editorial staff has been arranged for, the present Editors would suggest that an attempt be made to economize the space in the *Bulletin* by adopting a policy of condensation and excision, with a view to eliminating redundant matter without sacrificing the sense of the contribution. It would perhaps be inadvisable to abstract *Question Box* material as closely as in the practise followed by the editors of the *Question Box Revision,* but at least some attempt should be made to do away with the waste of space which heretofore has been an unavoidable evil.

In conclusion, the Editors desire to make grateful acknowledgment to Secretary T. C. Martin and to his indefatigable assistant, Miss Ella Morrison, for their valuable assistance and co-operation. It would perhaps be invidious to mention by name the host of enthusiastic contributors associated with the member companies in Chicago, Boston, Brooklyn, New York, Philadelphia, Denver and other cities, whose expert advice and loyal support have been the biggest factors in whatever success the *Question Box* may have achieved during the last year. The unfailing willingness of these and in fact, of *all* our contributors, to assist in this department of the Association's work, and the appreciative acknowledgments received from hundreds of members who have learned to depend on this department for prompt and practical assistance in the solution of their business problems, may well be accepted as the best possible evidence of the intrinsic value of *Question Box* service.

ERNEST A. EDKINS
ANNEBELL FRASER

APPENDIX

QUESTION BOX CLASSIFICATION—TENTATIVE OUTLINE

MAIN CLASSES

0. **UNCLASSIFIED—Miscellaneous**
1. **ENGINEERING**
2. **ACCOUNTING**
3. **BUSINESS BUILDING**
4. **MANAGEMENT**
5.
6.
7.
8.
9.

DIVISIONS

1. **ENGINEERING**
.1 STEAM ENGINEERING
.2 HYDRO-ELECTRIC
.3 ELECTRIC
.4 AIR AND GAS ENGINES—GAS PRODUCERS
.5 COMPRESSED AIR—REFRIGERATION
.6 BLOWING AND PUMPING ENGINES
.7 BUILDINGS
.8 ISOLATED PLANTS—BLOCK CENTRAL STATIONS
.9

1.1 STEAM ENGINEERING
.11 Steam Engines
.12 Steam Turbines
  Types
.13 Fuel
  Coal
  Oil
  Gas
.14 Furnace
  Chimneys
  Stokers
  Coal Conveyors
  Grates
.15 Boilers
  Superheaters
  Condensers
  Exhausters
  Instruments—Thermometers, etc.
.16 Steam Heating
.17
.18
.19 Lubricating Oils

1 2	**HYDRO-ELECTRIC ENGINEERING**
.21	Waterwheels
.22	Turbines
1.3	**ELECTRIC ENGINEERING**
.31	Generation
.32	Transmission Distribution
.33	Illumination
.34	Industrial and Power Applications
.35	Electric Processes
	Electrolysis
	Furnaces
	Plating
.36	
.37	Meters Measurements Tests
	Types
	Installation
	Reading
	Testing
	Repairs
.38	
.39	Weak Current Engineering
	Telegraphy
	Wire
	Wireless
	Telephony
1.3	**ELECTRIC ENGINEERING**
.31	Generation
.311	General
.312	Central Stations
	Substations
.313	Dynamo Electric Machinery
.3131	Construction Installation
.3132	Direct-Current Machinery
	Generators
	Motors
	Converters
	Boosters
.3133	Alternating-Current Machinery
	Synchronous
	Converters
	Asynchronous
	Rectifiers
.3134	Stationary Induction Apparatus
	Storage Batteries
	Regulators
	Transformers
.314	Switchboards—Central-Station Wiring
	Panels
	Switches
	Rheostats
	Protective Devices (station)
	Relays
.319	Records Cards

1.32 Transmission Distribution
.321 Systems
Direct-Current
Alternating-Current
Composite
.322 Lines and Conductors
.3221 *Overhead*
Pole-Line Construction
.3222 *Joint Pole Lines*
.3223 *Underground*
Conduit Construction—Manholes
.3224 *Cables—Conductors*
Insulations
.323
.324
.325
.326
.327 Preservatives for Wood, Etc.
.328 Protective Devices
Lightning-Arresters
Grounds
Fuses
.329 Records
1.33 Illumination
.331 Interior
Houses
Theatres
Stores
Factories
.332 Exterior
Streets
Parks
.333 Decorative Illumination
.334 Advertising Illumination
Signs
Windows—Store
Outline
.335 Lamps
.3351 Arc
Direct-Current
Alternating-Current
Flaming
Search-Lights
.3352 Incandescent
Carbon Filament
Metal Filament
.3353 Vapor
.3354 Glowers
.3355 Etching of lamps
.3356 Renewals
.338 Wiring
.339 Gas Lighting
Open-Flame
Incandescent

1.34	INDUSTRIAL POWER APPLICATIONS
.341	Heating
.3411	Domestic Appliances
	Vacuum Cleaners
	Cooking Apparatus
	Radiators
	Flat-Irons
	Washing Machines, etc.
.3412	Industrial Appliances
	Welding
	Thawing
	Glue Pots, etc.
.342	Motor-drive in various industries
.343	Electric Vehicles
	Commercial Trucks
	Passenger Vehicles
	Buses
	Pleasure
.344	Conveying—Hoisting
	Telpherage
	Elevators
	Cranes
.345	Pumping
.346	Mining
.347	Agriculture
.348	
.349	
1.4	AIR AND GAS ENGINES—GAS PRODUCERS
1.5	AIR COMPRESSION—REFRIGERATION
.51	Compressors
.54	Applications
.55	Refrigeration Machines
	Types
.56	Refrigeration
	Systems
.57	Ice Making
	Can
	Plate
1.6	BLOWING AND PUMPING ENGINES
1.7	BUILDINGS
	Power Plants
	Office Buildings
	Warehouses
.8	ISOLATED PLANTS—BLOCK CENTRAL STATIONS
2.	ACCOUNTING STATISTICS
.1	Meter readings
.2	Billing
.3	Bookkeeping
.4	Bill Delivery
.5	Collections
	Cashiers
	Collectors

ACCOUNTING STATISTICS—Continued.

.6 Complaints
.7 Filing
  - Stockholders' Records
  - Other

.8 Disbursements

3. BUSINESS BUILDING

.1 New Business
.11 Advertising
.12 Soliciting
.2 Rates
  - Lighting
  - Power
  - Heating

.3 Contracts
.4 Mercantile
  - Show and sales rooms

4. MANAGEMENT

.1 Organization
.2 Relations with Public
  - Company Policy

.3 Relations with Employees
.31 Organization
  - *Employment—Discipline—Rules*

.32 Welfare Work
  - *Pension Fund*
  - *Savings Fund*
  - *Sick Benefits*
  - *Library*
  - *Entertainments—Education*
  - *Medical Supervision*

.33 Compensation
  - *Salaries—Wages—Overtime*

.4 Legal Questions
  - Legislation
  - Franchises
  - Claims
  - Personal Injuries
  - Property Injuries

.5 Insurance
  - Fire
  - Liability

.6
.7
.8
.9 Relations with Other Companies

THE PRESIDENT: There is no doubt about the importance of the *Question Box* as a part of the Association work. I have thought at times that some of us were inclined to slight it and pass it over lightly, but for those who read it, it is impossible to avoid becoming interested. I am very glad to have seen the support which the entire membership has given this department, and I know it must have been a very great benefit. Is there any discussion?

MR. W. H. HODGE, Chicago: I wish to express appreciation of Mr. Edkins' conduct of the *Question Box* and to endorse his recommendation for classification. In this connection I shall give you a few notes prepared by Louise B. Krause, Librarian:

"The basic principle of a subject classification is easily explained. It simply means grouping together under one heading all information of the same character, for the purpose of quick use and comparison. In a library, books treating of the same subject stand together on shelves in a vertical file; manuscript data on the same subject stand together; and in a printed *Question Box* all questions and answers on like subjects should stand together.

Now although the principle and the usefulness of such an arrangement are clearly apparent, the method or ways of bringing printed material on the same subject together is not so simple, in fact it is an art, and as such has been studied over many years, by men having large experience in handling printed information. The art of grouping like information together is called by the technical library name of classification, and after many years of study and application, the library world has for the most part adopted the Dewey Decimal Classification scheme as the best and most workable system of classification on the library market.

The Dewey Decimal Classification scheme has three marked features which make it of much value.

1. It has a numerical notation; figures are easier to work with than letters, as symbols.

2. It is worked out on a decimal basis, *i. e.*, a series of ten numbers are sub-divided into ten and these again into ten and so on if so desired. It therefore permits of indefinite expansion without changing any figures already used. For example—Rates are designated as 3.2. This heading can be sub-divided

into Power Rates and Lighting Rates by the addition of another figure after the .2—thus keeping these heads as sub-divisions of the general heading "Rates."

3. It is so arranged that it correlates information, and subjects follow each other in a natural sequence.

For example—under Electrical Engineering we find:

1.31 Generation.
1.32 Transmission—Distribution.
1.33 Illumination.
1.34 Industrial and Power Applications.

and so we might continue.

Now the *Question Box* classification as used at present recognizes the need of grouping information under subjects, but the makers of it evidently did not realize the extent to which the *Question Box* would grow nor the variety of information which it would cover; and the fact is painfully apparent that the breadth of information contained in it has burst through the non-elastic system of classification provided and quite separated subject material which ought to stand close together. For example, in the present *Question Box* classification system you will find Illuminating Engineering 17—Street Lighting 28.

No better substitute for the present inadequate system of arrangement can be found than the application of the decimal classification scheme. The tentative outline submitted by the editors of the *Question Box* shows a careful study of the *Question Box* material and the need of closely correlating the material, with adequate provision for expansion. The adoption of this scheme will be neither difficult nor confusing. To the average reader of the *Question Box* it will rather facilitate its use by the closer grouping of related material.

This decimal scheme also provides headings and an adequate basis for the subject classification of the printed material which will be issued by the Commercial Section of the N. E. L. A. in its Commercial Digest and Power Data Book, thus giving an opportunity to put the classification of all printed information issued by the Association on a uniform basis, and marking it as an organization using the most scientific and up-to-date methods, even in as small a matter as library technology. [Applause.]

Mr. Joseph B. Seaman, Philadelphia: We expect very little news in the report of the *Question Box,* as the work is more or less the same from year to year. This year, however, we have had presented a comprehensive classification which seems to merit our consideration. No doubt Mr. Edkins' successor will see fit, under the direction of the Secretary, to adopt this classification practically as it stands. It seems to me that this should appeal to us for three reasons. In the first place, it is comprehensive and yet it is simple. One of the weaknesses of the present system of classification is its incompleteness. For example, if we have a question concerning central stations in general, there is no place provided for it in the present classification unless it be under the head of "miscellaneous." Another defect is the lack of correlation. In some instances related subjects are ten numbers apart, as has been called to your attention. The second reason is, it not only makes possible the classification of any question or subject, but it brings allied subjects together so that research and reference work are greatly facilitated. Third, the *Question Box* classification should appeal to us because it has been made up by one who has had much experience. My own views, for instance, on our own *Question Box* this year, have been changed considerably, and after studying this proposed classification more closely, we shall no doubt see its great usefulness not only for the present, but for years to come. [Applause.]

Mr. J. K. Jackson, Mobile, Alabama: It seems to me that the value of the *Question Box* largely depends upon the accuracy of the classification, and I would like to suggest to the new editorial staff that they employ on their force some one with broad library experience to work out the system of classification.

Mr. Homer E. Niesz, Chicago: It is interesting at this time, when the *Question Box* passes from the hands of a voluntary editor to the administration department of the Association, to note the increase in the efficiency of this part of the Association work since the change from an annual publication to a monthly bulletin. The *Question Box* was originally a large compilation of information published annually and it reached very few hands, for the reason that there were at that time very few individual members. Now contributions reach the individual members every month, which makes the information given in this text book, edited by men collecting from experts in every line of work, very valuable to the individual members, and so large a membership is drawing on this information that the value of the Association itself is enhanced to the individual members. The increase in efficiency goes still further, as a mail service is carried on that is of immense use to central stations which require immediate and snappy service, and I think that is a valuable addition. I would like to remark, in closing, that the *Question Box* is now reaching many thousands where a few years ago it reached only scores. [Applause.]

Mr. R. H. Ballard, Los Angeles: I agree with Mr. Niesz as to the efficiency of the *Question Box*. I still think that some of us in the business do not give this important part of Association work enough serious attention. It first came to my mind a year or so ago, and we then appointed one of our men, Mr. C. S. Walton, to read carefully all the questions which came up and to answer such as he could, alone or after consultation with others in the company. The result, in Mr. Walton's case, is that he is among the ten on the Honor Roll, for the greatest number of answers to questions last year. The result on him individually is that he is one of the most enthusiastic boosters for the work of the Association I have ever seen. The company, as a reward for his rather stiff work, selected him as one of the men to attend this Convention, but owing to personal reasons he was not able to come.

I think possibly it would be a good idea if some such policy were elaborated and pursued all over the United States, making it the duty of one man in each company to look after these questions. We would have a more comprehensive view of the questions and better answers. [Applause.]

Mr. Farley Osgood, Newark, New Jersey: I heartily agree with our California friend's suggestion, since we, in New Jersey, did something similar, but I think it might be carried one step further than either he or we have carried it, namely, that the company make known to the editor its representative on the *Question Box*, as he might be termed, and make known to the editor also the general line of information that might be expected from him or from his company through him, so that when questions of a certain class did not seem to be answered readily by those who should answer them, this fellow in the company could be written to with the request to stir up his associates and get good engineering opinions along certain lines. The *Question Box* has its unquestionable value chiefly from two sources, its clearness of cataloging and breadth, and the general correctness of the answers to questions. Mr. Edkins has related to-day that there were many questions poorly asked in years gone by and answered simply yes or no, which certainly did not help anybody very much. I think—and I do not mean any disrespect to earlier editors—I think Mr. Edkins and his associates this year have done more for the *Question Box* than any other group of editors we have ever had, because they have made the men who could do so answer questions fully and they have brought before us a result which is of a highly scientific and correct nature and which was undoubtedly needed when prepared and will be needed in the future. I think his suggestions, to be carried on by the staff, should be followed in every detail unless in working with them they are found to be impracticable.

THE PRESIDENT: Mr. Martin, have you any discussion?

THE SECRETARY: The discussion I have is very briefly presented by Mr. John C. Parker, Rochester, N. Y., who, two years ago, was the editor of the *Question Box* and devoted a great deal of time and attention to it, and has a bearing upon the point of the amount of expense and time required of the companies which in the past have assumed this burden. I may mention that I made several visits to Rochester, N. Y., to consult with Mr. Parker, and I usually found him and four young understudies hard at work on the *Question Box* to the neglect of their duties to the company.

MR. JOHN C. PARKER (by letter): To one who has had the privilege of editing the *Question Box,* there is always a large element of personal interest in noting the mental reaction that develops through the *Question Box* Report of each succeeding editor; and so, during the magnificent year of editorship just past, the writer has been wondering how Mr. Edkins would feel about it all when he had got to the end of his administration, and finds, interestingly enough, that Mr. Edkins is no exception to the general rule, that he has been very happy in the work, and has prized the opportunity as a pleasant privilege, as well as a serious duty. Interestingly enough, too, the editor finds at the end of the year that the job looks pretty big.

It is certainly a satisfactory commentary on Mr. Edkins' editorship that his year of effort has brought the *Question Box* to the point where it justifies a permanent staff at Association headquarters. Without making the comment invidious, one can appreciate that the work will be expedited, and a great deal of otherwise necessarily lost motion eliminated by this wise arrangement.

The indexing of the *Question Box* during the last few years has shown signs of being somewhat like a small boy's jacket in the period of adolescence, in that it has insisted in getting up about the shoulders in spite of every effort of the youth to make it cover an adequate fraction of his person. Mr. Edkins' swan song in the shape of tentative classification is a valuable contribution to the young manhood of his ward. Now that Mr. Edkins has sent the child on its way clothed in the garb of manhood, it is interesting to look at the record of the swaddling-clothes period of its growth, as given in the initial page of the report. The writer thought that he was really doing some work when the total number of contributions handled was less than two-thirds what Mr. Edkins has been able to bring through, and so finds himself wondering how Mr. Edkins and his immediate predecessor managed to do the many other things that they were doing, and accomplish such great things for the *Question Box* as well, not alone in the matter of mere size, but in the character of the contributions. Then he looks back to the previous years and finds that three of the editors not only did herculean tasks, but lasted for two years at the job. It certainly would seem that there were giants in those days.

THE PRESIDENT: Is there any further discussion? For a number of years we have had the privilege of listening to a paper by Mr. Paul Lüpke, of Trenton, N. J. For those who are acquainted with Mr. Lüpke it is unnecessary to make any explanation. Mr. Lüpke has long been interested in the Association, was one of the editors of the *Question Box*, and has done a great deal of excellent work in classification. He is a very charming man and his writings are little short of classics. These papers are presented as a finish to our first session at each Convention and have become historic. Mr. Lüpke is not able to be with us, but Mr. Martin will present the paper. Mr. Lüpke rarely reads his own papers. Mr. Martin has for some years done this, and as a consequence Mr. Lüpke in his own witty way has stated that he writes the papers and Mr. Martin dramatizes them. [Laughter and applause.]

I will ask Mr. Martin to dramatize this latest paper.

The Secretary: What is a man to do under a send-off like that? [Laughter.]

EXPANDED LOYALTY

It has been said that even a wise man can tell all he knows in half an hour, and that forever after he must repeat himself. If that be the truth, the time allowance for originality allotted to a mere dilettante, such as I, must be short indeed, and it gives me great concern to think that I have long since exceeded it. It was with considerable hesitancy, therefore, that I ventured to accept the invitation to address you once more, for you must remember that, in comparison with the professional lecturer, I labor under a decided disadvantage. He has a new audience in every town, while I must follow mine around year after year. Still to my comfort I know that on this occasion I face many susceptible Western minds, and pray, let the effete East—hold its peace.

Your President has kindly suggested that I attempt to hang a mantle of phrases around the plain, naked truth that "loyalty is part of that which an employee owes, not simply to his company, but to his industry"; hence the title of my paper.

When a man, in a serious moment, stops to consider whether or not he is doing his part in the world's work, his duties to his family and his country naturally receive first consideration. He fully realizes that, by all laws of nature and men, he is responsible for the well-being of the former and that he is absolutely dependent upon the protection the latter affords him. Therefore, he reasons that he must be loyal to both.

Now, when he has arrived at that conclusion, as he must, let him take the next obvious step. How does he secure the means to prove his loyalty to family and country? Only by doing a man's share in promoting the welfare of that particular industry with which he has chosen to throw his lot. That is self-evident. A man's obligations to his family include the duty to provide reasonable comfort and to make provisions for emergencies; his obligations to his country embrace the honest fostering of its material progress, and to neither the one nor the other can a man do justice unless he has the welfare of his industry at heart. If but all men in all industries realized that simple truth many a problem that sorely vexes us now would be solved.

Unfortunately the even voice of reason, advocating sane progress, has been drowned in the din of megaphone shouts bellowed at us from every quarter, echoing and reverberating in the columns of the press, from the rough-and-ready dailies to the stately periodicals, till every earnest effort to improve conditions from above is distorted into pharisaical pretense, and initially rational schemes for betterment from below degenerate into dynamic brotherly love; truly they fatten the beast of social unrest they pretend to fight. If we want to prevent delirium it is time for all to sober up. It takes but two to make a .quarrel, but the third gets the worst of it. Let that third party beware and stop its egging on.

In the meantime it behooves us to go about our business undismayed. Ours is the central-station industry, and we have the right and the duty to use every honorable means to promote its welfare. That welfare depends primarily upon the loyal co-operation of all concerned. The problem is, how can that best be secured?

To create loyalty of the true breed, the concern that expects it must prove itself worthy of it; that is the indispensable requisite. One who knew, more than a century and a half ago made this statement:

"It is the fate of those who toil in the lower employments of life to be rather driven by fear of evil than attracted by the prospect of good; to be exposed to censure without hope of praise; to be disgraced by miscarriage or punished for neglect when success would have been without applause and diligence without reward."

There you find concisely set forth the exact conditions we must get away from, and unless we do, it is futile to expect true loyalty, all preaching to foster it will prove but hollow sound, and all fine words in praise of it but vain mockery, for—without legal training—none of us can manage to be loyal where we have no faith. It is the concern of the companies to wipe out such superannuated notions and to establish beyond cavil that they merit the loyalty they crave.

This Association has blazed a trail that should develop into a common highway, and many of the companies have already progressed far upon it; they are steadily marching ahead and in spite of taunts and jeers they are keeping a steadfast eye upon the final goal. Believe me, the companies have had their day of Damascus, they have seen the light, they realize that they owe a faithful man something more than mere wages, they are trying hard to find the right way to instil into the minds of their employees the conviction that their concern is the company's concern, and to bring home to them the fact that honest service, together with reasonable thrift, means security under all circumstances, just as much security, and perhaps more, than a man's own business would provide. When that disposition of the company manifests itself, and rare indeed now are the cases where it does not, it is distinctly up to the employee to do his part. Now what is his part?

In the first place he must be an honest man; unless he is that he can never be a desirable employee. That statement needs no elaboration. Next he must to the best of his ability carry out the duties directly assigned to him. That also is self-evident. But the man who cannot and does not expand his loyalty beyond these two axioms is the rankest standpatter. All progress lies beyond his vision and comprehension; he is lucky indeed if he can manage to stay where he is.

"The only way to get more pay for what you do is to do more than you get paid for."

This is not a rehash of a hackneyed paradox, like the routine epigram salted with a grain of truth to make it palatable and seasoned with a pinch of wit to make it bite; it is nothing but a simple truth. If you will but look around you, if you will but observe dispassionately and without squint-eyed jealousy, the career of those who have risen at your very side, you must acknowledge that it is the truth; and, far better still, if you will but put it to the test in your own case, not in a haphazard, fitful fashion, not for a single day expecting full returns the next, but with faithful persistence day in and day out, you will prove to your own satisfaction that it is the truth. Don't be afraid that nobody will catch you at it. There is an eager watch set for the slightest manifestation of that kind of work, and there is no concern so puny but that it will manage to provide a proper reward for it, nor was there ever yet a trust too unwieldy to be moved by it.

Loyalty to your employer means a step out of your way whenever that step is necessary to conserve his interest. There are occasions when the sacrifice of a few minutes of your own time may save the company as much as your regular time is worth for several years. You are not loyal if you do not make that sacrifice. Yet, there are those who lull themselves into a comfortable sense of self-righteousness though they doff their loyalty with their overalls or lay it aside with their office coat. They slam the shop door behind them with a vicious the-company-doesn't-own-me bang, and sally forth to their own particular haunt among men to swing the sledge with the rest. I think they call that being independent.

Now let me tell you a plain fact, verified by years of observation. There is no more infallible way to tie yourself down to the fate of a hopeless underling than persistent knocking of the concern that employs you. Fools will praise you because you are like them, but remember, there is no poison more deadly than the blight of a fool's praise. Sensible men will treat you with contempt because you are making a fool of yourself, and you will establish a reputation that draws a dead-line across your path to advancement.

That is what this sort of thing will do for you individually; that it will not help your company I need not tell you; that it puts a blight upon the whole industry you may dimly realize. Why, then, in the name of common sense do you do it? If your knocks represent your honest conviction get out and keep at it; we will fight you but we can respect you. If your knocks are bred from stupid habit, want of thought or bloated conceit, mend your ways, and quickly. We must have these ten thousand individual members of this Association loyal to the core and in the broadest conception of the word. These ten thousand form quite a respectable part in themselves of that many-headed public opinion that wields the big stick, and if they put their minds to it, they can influence other thousands by the score. All that vast influence for the benefit of our industry can be secured if everyone connected with it does his part conscientiously in his own sphere, however limited that may be. Everyone of us has opportunity to discourage untrue, unfair or exaggerated statements concerning the central-station industry; let him use his opportunity consistently, firmly and with discretion. But let everyone refrain from expressing opinions on subjects connected with our business "unless he be fully informed as to all the facts relating thereto and as to the purpose for which the information is asked."

Conduct of this kind presupposes that a man avail himself of every means to augment his store of general information and to broaden his view on all matters concerning the central-station industry. What better way is there to do this than by lively participation in the various activities of this Association, where free interchange of ideas and experiences is the password?

And that free interchange is a duty which loyalty to your fellow employees imposes upon you. Do not allow yourself to fall into the false notion that you can help your weaker brother best by throttling your own abilities down to his limitations. Strive by all honest means to realize the rewards of your ambition, but after you succeed do not forget him. Be careful in all your dealings to give full credit where it properly belongs, and stand up like a man for any reputable fellow employee who seems to suffer through misrepresentation. Endeavor with all your might to eliminate the gall of misunderstanding that injects the bitterness into the endless strife that seems to be our lot. We are all but serving out the indeterminate death sentence fate has imposed upon us; let us in common charity try honestly to ameliorate the burden of it.

And now that I have roughly outlined in some fashion the proper business conduct of the central-station men, I make bold to offer a suggestion for the consideration of the Association.

Many of you will know that but recently the American Institute of Electrical Engineers has finally adopted, after years of deliberation, a "Code of Principles of Professional Conduct" wherein are given in concise form the rules that should guide the conduct of the professional Electrical Engineer. Would it not be proper, would it not be of great benefit to the industry, if this Association promulgated a similar code, laying down the precept that should govern the business conduct of the central-station man? It would then be at least tacitly understood that when a man joins this Association as an individual member he feels himself in honor bound to live up to this code. Would not this add greatly also to the appreciation of the value of our individual membership on the part of our employers, and would it not altogether be a gaining stride forward in bringing about that community of common interest which is the basis of the solid progress of the industry?

The formulation of such a code is not a one-man proposition; it should be entrusted to a committee composed of the ablest men available, and for that reason I do not venture further than the mere suggestion that it be given consideration.

There being no discussion the meeting then adjourned.

SECOND GENERAL SESSION

WEDNESDAY MORNING, JUNE 12

THE CHAIRMAN, PRESIDENT GILCHRIST: We shall now hear the report of the Rate Research Committee, Mr. E. W. Lloyd, Chicago, Chairman.

REPORT OF THE RATE RESEARCH COMMITTEE

REVIEW OF THE WORK

Your Committee last year studied at length the principal rate systems in use, and developed models of these rate systems which showed that although theoretically the systems differed largely in form throughout the country, the actual results obtained were not dissimilar. As a foundation for its work, the Committee agreed on the following definition:

Fair Return

> "Your Committee is of the unanimous opinion that charges as a whole should be no more than sufficient to pay expenses plus a profit high enough to attract capital into the central-station business. This, however, does not mean that each customer should necessarily pay the same profit or give the same return on his portion of the investment as every other customer, so that a so-called maximum rate, with the customary minima for meter rent, break-down service, etc., will be entirely proper, especially when demanded by public opinion, even if some particular customers are served at an apparent loss."

It then turned its attention to a particular class, the residence consumer, and as a result of its deliberations the following conclusions were reached last year:

Minimum Charge

> "Your Committee is unanimous that any rate should include a minimum charge per month or per year."

Differential

> "The Committee is by no means unanimous as to whether a differential for residence business is desirable, but is unanimous that, if it be adopted, either a quantity discount* or a differential based on hours' use of maximum, or its equivalent, is the best."

Floor Area

> "Your Committee recommends floor area as the simplest, fairest, cheapest and most practical, constant and

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*In the 1911 Report the resolution read * * * "either a plain wholesale or a differential." * * * but it is considered that the term, quantity discount, explains more satisfactorily what was intended in the original resolution.

> **easily understood method of determining such a differential, although it has no recommendations to make as to whether this shall be used directly or reduced to the number of rooms."**

This year the Committee continued its discussion of residence rates, but still finds that it is not unanimous as to the use of a differential in residence business. On the other hand, in its discussion of large and wholesale business, the Committee is of the opinion that some form of the demand system is the best method of charging for this class of business. The difference of opinion upon the use of the demand in small or residence business, as it was discussed meeting after meeting, made it at first appear that it would be impossible for the Committee to submit a report which would be acceptable to the Association. As the discussion developed, however, it became apparent that the difference of opinion within the Committee fairly represented a general difference of opinion held throughout the country, not only among the member companies, but among the commissions and other students of the rate situation. Your Committee thereupon concluded to assume that these differences of opinion are entirely right and proper, and this report is therefore unanimous and representative in that it assumes that either a system which recognizes demand or a straight-line meter rate with, in some cases, quantity discounts, is a proper rate for small and residence business.

A great deal could be said in recommendation of both general methods proposed for the small consumer, and the choice of one or the other must depend entirely upon the view-point of individual companies gained through knowledge of the conditions existing in their own communities. A tendency of future development indicated in one part of the country may not be at all evident in another, and for this reason the Committee has agreed to formally recommend for small customers two methods of charging of distinctly different nature, even though it has previously emphasized the great desirability of uniformity in this respect. It is the thought of the Committee that, should these two methods become generally recognized, matters would be infinitely better than they are at present, especially if the development in the various communities is so distinctly different as to indicate plainly the reason for preferring one to the other.

SCHEDULE OF MEETINGS

Well-attended meetings of the Rate Research Committee were held during the year as follows:

Friday, November 10, 1911, at Cleveland, Ohio.
Friday, December 8, 1911, at New York City.
Thursday and Friday, January 4 and 5, 1912, at Cleveland, Ohio.
Wednesday and Thursday, February 7 and 8, 1912, at Chicago, Ill.
Monday and Tuesday, March 4 and 5, 1912, at Chicago, Ill.
Thursday, April 18, 1912, at New York City.

After the work of the Committee was well under way, it was found that, owing to the long distance to the meetings for the majority of the members, and the involved nature of the matters discussed, two-day meetings were necessary in order that proper results might be accomplished.

SPECIAL WORK OF THE COMMITTEE

In 1911 the Committee found the compilation of rate data and information insufficient for the proper prosecution of its work. It became apparent that the opinions of courts, rules and decisions of commissions and of experts, and such other general information as would facilitate the work of rate research, should be collated and made readily accessible to the members of the Rate Research Committee and to the member companies. The following outline of such work was drawn up at the first meeting:

I. *History of Rates*
    A. Proceedings of the National Electric Light Association.
    B. Proceedings of other associations.
    C. Technical papers.
    D. Personal data.

II. *Court Decisions Relative to Rate Regulation in the United States Applicable to Electric Lighting*
    A. Supreme Court.
    B. Federal Courts.
    C. State Courts.

With a synopsis of decisions and with such comparisons of disputed points as may be necessary.

III. *History of Government Regulation*

A. Interstate Commerce Commission.

B. State Legislatures and State Public Service Commissions, with a comparison of laws, rules, opinions and decisions.

IV. *Definitions*

A determination of the proper definitions of all electric rate regulation terms.

V. *Rate Preparation*

An outline of the proper method of preparation for rate investigations for the use of electric light companies. This might also lead to suggestions for co-operation among the smaller companies.

VI. *Comparative Rates*

A comparison of the rates of various cities and a study of the influence upon rates of such conditions as the existence of natural gas, the availability of water power, the effects of State or city rate regulation, and the influence of neighboring rates, or rate methods upon the rates of cities.

The Committee thereupon appointed a secretary, opened an office in Chicago and employed additional help for this work.

It was the intention of the Committee to present with its 1912 Report at least a part of this compilation, but soon after the work was started, its vast amount of detail and extreme importance became apparent, and, although considerable progress has been made and a large amount of information is now at the disposal of the member companies upon inquiry, it was deemed advisable to continue the work and publish a separate report later in the year.

This work also developed the necessity of making a general classification, including definitions of all rate terms, and the plan thus enlarged has already had the informal approval of some of the commissions regulating electric companies and of associations interested in allied industries.

In this connection the Committee recommends that the systematic arrangement of rate terms and definitions be completed at the earliest date, and that the result be referred for approval or criticism to other interested associations, so that eventually there may be established through the National Electric Light Association an international code of rate terms and definitions.

MEMBER COMPANY ASSISTANTS

The special work of the Committee could not be carried on by any single individual, and it became necessary to appoint member company assistants to aid in this work throughout the country. The Committee at this time wishes to express its appreciation of the loyal support and co-operation which it has received from these assistants. A large amount of valuable data has been received, and local news and decisions have been criticized and digested by those most familiar with the facts. The Committee believes that this will result in each company having its own rate expert, and may eventually evolve a corps of efficient men who will be in complete touch with the rate situation as it develops and able to give ready support to your Committee in its work and aims.

It was felt that much of the data received by the Committee from general sources and from assistants had an immediate value and should be promptly given out to the member companies. The Committee has, since January 17, issued a weekly Bulletin to its member company assistants, in which all rate information as it came to the office has been briefly outlined.

THE WORK OF THE RATE RESEARCH COMMITTEE RELATIVE TO EXISTING REGULATIVE COMMISSIONS

It has become evident that an extremely important work can be accomplished by this Committee relative to existing public service commissions and in establishing rate standards for new commissions.

This has been pointed out by the Board of Gas and Electric Light Commissioners of Massachusetts in one of its decisions, in which it says:

> "After carefully noting the various schedules of rates of the companies under supervision and their effect upon revenues, output and operating efficiency, two things are evident, namely, that the men engaged in the business

> seem agreed upon the present necessity for differential rates, and that there is no general agreement among them as to the theory or principles upon which such differential rates should be based. The Board believes that the available experience is not yet sufficient for reaching any just or final conclusion as to the expediency of prohibiting or restricting differential rates."

The report contains a hint that a larger agreement among producers of electricity as to the whys and wherefores of rate making will be of decided benefit to the industry.

This statement crystallized the feeling that your Committee had for some time entertained, and in presenting the conclusions reached during the year it again points out the need at this time of the National Electric Light Association taking the initiative in the rate regulation situation. It must secure uniformity in its rate systems and definitions. It must meet fairly its differences of opinion on rate theories and present them boldly.

In this connection it may be pointed out that no other utility at the present time has such an opportunity presented to it. That the electric light industry will fail to see and meet this situation is not be to considered for one moment. It has met every big emergency in its history promptly on time, and sometimes before the actual necessity arose, and that it will repeat itself in this instance is to be expected, absolutely.

CONCLUSIONS

The Committee also submits the following memorandum giving the trend of its discussion and the result of its deliberations during the year as to the form in which rates should appear.

General

The great necessity of adopting as rapidly as possible, uniform methods of charging for central-station service has already been pointed out. It is not alone sufficient that some general policy of rate making be recognized by the several companies, but it is very desirable that the actual *form* in which the rates are placed before the public should be as nearly alike as possible.

The Committee believes that retail rates quoted in schedules may be gross rates, subject to a moderate cash discount for payment within fifteen days or less from date of bill. Giving half the cash discount during the succeeding ten days has been adopted by some companies and found to expedite collections and promote friendly relations with the consumer.

The question often arises whether it is better to have, say a 20-cent rate with a 2-cent allowance for prompt payment, or an 18-cent rate with a 2-cent penalty for slow payment. The latter has an apparent advantage in that the list price is lower, but the former has the advantage of being more popular with customers, and we recommend it since there is no reason why the net price, rather than the list price, should not be used for all advertising purposes, as, for instance: "The electric company has reduced its net rate on bills paid within fifteen days to .... cents per kilowatt-hour."

The specific recommendations of the Committee regarding forms of rates to be considered for the several distinct classes of customers are given herewith.

Customers of Large Size

The Committee agrees unanimously in recommending that all large customers be charged on a schedule making separate and distinct demand and energy charges. They recognize, however, that there are local conditions under which quantity discounts, or a straight line or block rate involving quantity, seem desirable. The unit charges per kilowatt of annual maximum demand and per kilowatt-hour consumed may be made to decrease respectively with an increase in the number of units of annual maximum demand, and the number of units of energy consumed monthly, according to a block system, applying to both the demand and energy charges. By allowing the unit charges to decrease in this way the equivalent of a customer charge is worked into the rate schedule.

Feature Rates

The Committee believes that for storage battery charging, for refrigeration and for other similar classes of business still lower rates can properly be made, for which separate schedules may be desirable.

Lamp Renewals

The Committee believes that it is for the best interest of central stations and the public that the rate for electricity should be such as to permit the free renewal of standard lamps and the offering of other lamps at such low prices as to prevent dealers from competing with inferior lamps; or, if this policy is not adopted, the offering of lamps only at such prices as to encourage dealers to compete with a good quality of lamp.

Minima

There should be an appropriate minimum charge per customer. There should be a minimum charge per kilowatt for auxiliary or break-down service. There should be a guarantee of income in contracts which require extensions to plant or lines and which might otherwise be unprofitable.

Subject to these minima, the company should have for ordinary conditions a maximum rate per kilowatt-hour.

Modification Necessary for Small Consumers

Differences of opinion exist in regard to the modifications that should be introduced when the size of the customer to whom the demand rate for large customers applies decreases to a certain limit, the value of which is also open to discussion. The line of demarcation between large and small consumers should be drawn somewhere between $50 and $200 per month for light, and somewhere between $10 and $100 per month for power. While it is entirely possible to measure both the maximum demand and the energy consumed in the case of large consumers, it is obviously impracticable at present to go into such refinements in the case of smaller consumers, and, as a consequence, certain approximations must be made in fixing the cost of service to the small consumer, which in turn require some average condition to be recognized as a basis for calculation. To just what extent it is desirable or necessary to average the conditions under which service is rendered to the small consumer is the point upon which the Committee has been unable to agree.

Modification—Using a Single Rate for Small Consumers

On the one hand, all customers less than a certain size may be averaged in one large group regardless of load-factor, and a kilowatt-hour rate applied to all alike, the only differential recognized being one based entirely upon the quantity of energy used. This method of treatment leads to the adoption of a block rate embodying kilowatt-hour charges only for all consumers not previously considered as large customers. The reduction in kilowatt-hour rate to customers using fairly large quantities of energy has the effect of introducing into their bills the equivalent of a customer charge. The general level of the kilowatt-hour charges in this rate would, of course, be higher than in the case of the rate for large consumers, in order to cover the demand and customer charges involved in rendering service to the average small consumer. This rate should carry with it a suitable form of minimum. The first step in such a block rate could include so many kilowatt-hours that the average residential consumer would receive his entire energy-supply at a straight-line meter rate, thus presenting to him an extremely simple rate and one that he can readily understand. As this rate gives to all small consumers, both residential and commercial, a charge based entirely on a quantity of energy consumed each month larger than the average residential customer is likely to use, it does not offer him a very great incentive to adopt any of the electrical devices which add so greatly to the convenience and utility of electric service.

Modification—Using a Two-Charge Rate for Small Consumers

The desirability of more strongly encouraging long-hour use of service has led, on the other hand, to the recognition of a rate which will give even the smallest consumer the advantage of a decreasing unit-charge for energy with increasing load-factor. To accomplish this a two-charge system which recognizes the demand and the energy consumption as independent elements in the cost of service is required, as in the case of the large consumer. Under such a system the small customer receives a like benefit of long-hour use of his service, even where the quantity of energy consumed would of itself not warrant a reduction in his unit-charge under the block kilowatt-hour rate.

Form of Two-Charge Rate for Small Commercial Consumers

In order that a customer may receive some benefit from the long-hour use of his service, a differential rate must be established involving the elements of both demand and energy consumption. In the case of small commercial consumers, a majority of the Committee recommend that a method of charging apply as indicated in the schedule of rates shown on Sheet 2, with the understanding that the electrical demand (always measured in the case of the large consumer) may be estimated, if desired, for the small commercial installations on the basis of connected load. It is believed that even the smallest commercial installation would accept a rate, making separate demand and energy charges, without question, and as such a rate is the simplest form of a two-charge rate it is recommended for adoption wherever possible.

Demand Element in Two-Charge Rate for Small Consumers

While it is believed by many that the actual measured electrical demand of the small consumer is the theoretically correct demand basis of a two-charge rate, and that it will ultimately prove to be the general basis used, there are certain reasons why such an electrical basis of demand rating cannot be adopted exclusively for commercial use at the present time.

FIRST.—There is at the present moment no reliable device on the market for measuring electrical demand generally at a cost sufficiently low to admit of its application to consumers of small size.

SECOND.—In residential service, the lighting demand constitutes at present the greatest *average* demand, but it by no means represents the greatest individual maximum demand, taking into account the use of heating and cooking devices and other power applications. However, the diversity-factor applying to the use of such apparatus is so great at present that it is not deemed wise to adjust the demand charges, properly determined by the lighting load, on a basis which would at this time include other applications of service. When these other applications become of more than incidental importance in affecting the demand of any individual group of customers, they should properly be considered in establishing the electrical demand as a basis for rates. Until that time arrives the fact that the heating and cooking devices are used on the customer's lighting circuits makes it impracticable to separately measure or control the lighting demand without also bringing the heating and cooking demand into consideration, which, as just pointed out, is not a desirable thing to do at present.

Form of Two-Charge Rate for Residential Consumers

In the case of residential service, it is not considered advisable to attempt to make separate and distinct demand and energy charges, for, to the residential consumer, whose use of service may vary greatly from month to month, a fixed monthly demand or "service charge," as he regards it, appears very burdensome and unjust. In order to overcome this objectionable feature it is recommended that a rate involving the use of a certain amount of energy, as explained later, at a primary rate per kilowatt-hour each month before a lower secondary rate applies, and embodying a suitable minimum, be adopted for residential service.

Two-Charge Rate for Residential Consumers

Under the form of a two-charge rate recommended for residence business, the customer pays for a certain number of kilowatt-hours consumed each month at a primary rate, and for all kilowatt-hours in excess of this quantity at a lower or secondary rate. In some cases a still lower tertiary rate is applied to all energy consumed in excess of the amount required at a primary and secondary rate. The number of kilowatt-hours that must be consumed at each higher rate before the next lower rate applies ordinarily depends upon the customer's demand. By making the number of units to be used at the primary rate equal to a constant plus some function of the consumer's demand, or by decreasing the number of hours' use of demand at the primary rate as the demand increases, the equivalent of a customer charge is embodied in the schedule. The action of this rate is obvious. The fixed charges are covered by the difference between the low final rate and the primary rate which applies to the predetermined quantity of energy used at the primary rate.

Minimum Demand in Two-Charge Rate for Small Consumers

While the demand for small consumers should be based primarily on electrical demand, there are excellent reasons for establishing certain minimum values of demand for these consumers, depending, in the case of commercial service, on the connected load, and, in residential service, on the floor area or number of rooms. It is the understanding that in ordinary cases the demand as established by this minimum will be used in place of the measured electrical demand, thus not only saving a great deal of expense by eliminating measurement of the demand of the small customer, but at the same time assuring the station a minimum return from the small consumer which is to some degree fixed by the value of the service to him.

Lamp Efficiency and Minimum Demand

A very important reason for establishing a minimum demand to apply to the small customer served on a two-charge system is involved with the efficiency with which energy is utilized in lighting. The efficiency of light production is unsettled, not only because changes are now being generally made by customers to the more efficient types of incandescent lamp, but also because lamps of lower wattage and higher efficiencies seem inevitable. Until the probable limit of development can be more fully predicted, or until the growth of other applications of service makes the lighting demand of incidental importance, the central-station's fixed service and demand charges must be protected by the rate schedule. It is obvious that the fixed charges of central stations would not be reduced by any general and sudden decrease in the present electrical demand, which would simply leave a portion of the generating equipment idle, and as such a general reduction is at least not beyond the bounds of probability as long as the lighting service retains its present importance and the incandescent lamp seems capable of so much further improvement, it is advisable to provide a minimum below which the electrical demand shall not fall in the case of each consumer, such minimum being based on some approximate measure of the value of his lighting service. For residential customers, this general idea finds expression in rates involving the use of floor area or active rooms, as in Detroit, Milwaukee, St. Louis and Toronto.

Rate for Very Small Consumers

In certain sections of the country local conditions indicate the necessity of providing an extremely cheap and simple method of serving consumers of very small size. Consumers whose maximum demand would fall between 100 and 300 watts could probably be charged on a pure demand rate, the demand being controlled by some form of current limiting device, several types of which are on the market. The customer under such a rate pays a fixed monthly charge per watt of maximum demand for which his controller is set. Theoretically the unit demand-charge should decrease with the size of the customer, in order to provide the equivalent of a customer charge (as in the rates for large users), but practically it is hardly necessary to go into such detail. Under such a rate the customer's bill is the same from month to month, which meets with his approval, the billing is simplified and the periodic reading of meters as well as a large part of the meter expense is eliminated.

Desirability of Having Controlled Flat Rate for Very Small Customers

A demand rate for the very small consumer will generally serve to introduce electric service where it would otherwise remain unknown, and as the consumer grows in size or wishes to take advantage of heating and cooking devices he will naturally be transferred to rates that permit of their use. It must be distinctly remembered that, while there may be many localities where the need of such a rate is not felt, in many others it would prove profitable. The Committee, in attempting to make its report of widest and most general use, has of necessity adopted several view-points and endeavored to recommend as few rates as possible to cover the fundamentally different local conditions which it recognizes as existing.

Consumer	Type of Rate Recommended	
Large Consumers, Lighting and Power.	A block rate making separate demand and energy charges, or under special local conditions, a straight line or block rate, involving quantity discounts, may seem desirable.	
Consumers Whose Use has Special Features.	A lower block rate making separate demand and energy charges.	OR Straight line meter rate carrying kw-hr. charges only. Suitable minimum.
Small Consumers, Commercial Lighting and Power.	EITHER A block rate making separate demand and energy charges. Based on electrical demand with a minimum demand.	OR A straight line or block rate carrying kw-hrs. charges only. Suitable minimum.
Small Consumers, Residential.	EITHER A two-charge rate based on demand, with a minimum demand estimated on a floor area or room basis.	AND/OR A straight line or block rate carrying kw-hrs. charges only. Suitable minimum.
OR Very Small Residences.	A demand-rate based on controlled or limited demand.	——

Summary

To sum up the general situation briefly the Committee recommends that the foregoing rates be made to consumers of the several classes mentioned.

RATE DEFINITIONS

The Committee has approved the following definitions of the various methods of charge for electric service:

Flat Rate

The term "Flat Rate" is applicable to any method of charge for electric service which is based on the consumer's installation of energy-consuming devices or on a fixed sum per consumer. Meters are not used.

Demand Rate

The term "Demand Rate" is applicable to any method of charge for electric service which is based on the maximum demand during a given period of time. The demand is expressed in such units as kilowatts or horse-power. Maximum-demand indicators or graphic meters are used.

Meter Rate

The term "Meter Rate" is applicable to any method of charge for electric service which is based on the amount used. This amount is expressed in units, as kilowatt-hours of electricity. Integrating meters or graphic meters are used.

Consumer's Output Rate

The term "Consumer's Output Rate" is applicable to any method of charge for electric service based on the consumer's output. The unit of the consumer's output may, for example, be a gallon of water pumped, a barrel of flour, or a ton of ice made.

Two-Charge Rate

The term "Two-Charge Rate" is applicable to any method of charge for electric service in which the price per unit of metered electric energy for each bill period is based upon both the actual or assumed quantity of electric energy consumed and the actual or assumed capacity or demand of the installation.

Three-Charge Rate

The term "Three-Charge Rate" is applicable to any method of charge for electric service in which the charge made to the consumer for each bill period consists of (a) a sum based upon the quantity of electric energy consumed, (b) a sum based upon the actual or assumed capacity or demand of the installation, (c) a charge per consumer.

Straight Line

The term "Straight Line," as used in connection with and as applied to any method of charge, indicates that the price charged per unit is constant, *i. e.,* does not vary on account of any increased or decreased number of units. The total sum to be charged is obtained by multiplying the total number of units by the price per unit.

Block

The term "Block," as used in connection with and as applied to any method of charge, indicates that a certain specified price per unit is charged for all or any part of a block of such units, and reduced prices per unit are charged for all or any part of succeeding blocks of the same or a different number of such units, each such reduced price per unit applying only to a particular block or portion thereof. The total sum to be charged is obtained by multiplying the number of units in the first block by the price per unit for that block and adding thereto the number of units in the second block times the price per unit for that block, and so on until the sum of the units falling within the different blocks equals the number of units to be charged for.

Step

The term "Step," as used in connection with and as applied to any method of charge, indicates that a certain specified price per unit is charged for all or any part of a specified number of units, with reductions in the price per unit based upon increases in the number of units according to a given schedule. The total sum to be charged is obtained by multiplying the total number of units by the price applying for this number of units, or by the primary price, and deducting the discount applying for this number of units.

These definitions were originally suggested by the Second Public Service District Committee on Gas and Electric Schedules, New York State, and were finally adopted at a joint meeting of that Committee and the Rate Research Committee. They have, furthermore, been approved by the Committee on Terminology.

RATE SCHEDULES

Many commissions have already required the filing of rate schedules. Three commissions have required it since January 1, 1912. The preparation of rate schedules and the proper filing and publishing of the same is a mechanical operation, but no feature of utility publicity establishes more clearly in the minds of the public the feeling of security and of the ultimate fairness of a public service corporation.

The Committee, therefore, recommends the adoption of the forms of schedule annexed to this report, which in general conform to the schedules required by public service commissions at the present time. The Committee further suggests that member companies file such schedules regularly with the National Electric Light Association as soon as possible, and we hope not later than September 1, 1912, for the information of other member companies, and so that the company filing the schedule can, if it desires, obtain the benefit or the advice and criticism of the Rate Research Committee. This would place a more complete set of rate schedules from member companies on file in the central office and facilitate the sending out of rate information on demand. Such companies as are already filing their schedules with commissions or local authorities could without much trouble send an additional copy to the Association and get the benefit of the advice and criticism of the Rate Research Committee. The education on rate matters which member companies themselves will get in the compiling and filing of schedules will be most useful, and the effect of having previously filed schedules with the National Electric Light Association will have a very desirable influence upon new commissions as they may be formed.

RECOMMENDATIONS RELATIVE TO FORM AND CONSTRUCTION OF SCHEDULES

Size and Arrangement

Schedules are to be made up of loose-leaf sheets of a size 8 in. by 11 in., sufficient in number to cover the matter to be contained, and, when complete, so fastened together that any sheet may be removed and a new sheet substituted or additional sheets added.

Schedules may be printed, mimeographed or typewritten.

A complete form of the schedule matter consists of:

A. One sheet for the title page.
B. One sheet for the table of contents.
C. One or more sheets for each rate table.
D. One or more sheets on which to give the terms and conditions.

E. One or more sheets on which to give definitions of terms used in the schedule and to explain reference marks used in the schedule.

F. One or more sheets on which to give standard riders applicable to the schedules.

G. One or more sheets on which to give price of lamps to consumers.

The sheets should always be numbered and arranged in the order noted above.

Title Page

The title page shall show the following information:

A. Number of the schedule with a prefix, being the abbreviated name of the company, as Blank Elec. Co. For example, the first schedule would be Blank Elec. Co., Schedule No. 1.

B. The name of the corporation issuing the schedule.

C. The territory or territories supplied.

D. The day, month and year on which the schedule is issued.

E. The day, month and year on which the schedule is to take effect.

F. The number of sheets included in and comprising the schedule.

Table of Contents

The table of contents should give a full and complete statement in alphabetical order of the location where information under general headings, by subjects, will be found, specifying sheet number or numbers.

Rate Tables

On the rate table sheets a general title to the rates should be given, and also a letter, and throughout the schedule, wherever such rate is referred to, reference to it should be given by its letter. Each rate table should contain, in the order of arrangement given, the following:

A. CHARACTER OF SERVICE.—Under this heading should be stated the exact class of consumers, to whom the rate shall apply, and any limitation applicable to that class.

B. Rate.—The basis, or unit rate or rates, or series of unit rates, used in compiling the total charge to the consumer. When a system of block or step discounts from a base rate is used instead of a series of unit rates, such discounts must here be shown. Such discounts should not, however, be confused with prompt-payment discounts.

C. Discounts.—If any discounts or reduction in unit rates are allowed for prompt payment, or delayed payment penalties, such discounts or reductions or penalties must be given under this heading, with a clear explanation of the conditions under which discounts are allowed.

D. Minimum Charges.—The amount of minimum charges to be guaranteed, if any is required, and on what such charges are based, if not given in the rate.

E. Lamp Renewals.—Reference should here be made as to whether standard lamps are renewed free, or whether a discount or allowance is made in consideration of the consumer paying for his own lamps.

F. Standard Riders.—All riders which may apply to this contract are to be referred to at this point, reference being made to the number given in the list of riders upon a later sheet or sheets in the schedule.

G. Term of Contract.—The time of the contract relative to its duration, or term, or cancellation, should here be noted.

Terms and Conditions

On the terms and conditions sheets give all the terms and conditions which in any way may affect the furnishing in the first instance, and the continuance or discontinuance, in the second instance, of the service. Many companies have found it possible to use one set of terms and conditions for all rates, and it is therefore recommended that general terms and conditions be drafted applicable to all contracts.

Explanation of Terms and Definitions

On the sheets where information under this caption is to be shown should be given an explanation of the technical terms used in the schedule or generally applicable to the electric light and power business.

All definitions of terms and explanation of symbols, abbreviations or reference marks should be arranged in logical sequence in such manner that they may be readily referred to.

Standard Riders

A complete list should be given of all standard riders applicable to any contract listed on the rate sheets, each under separate number, so that any such rider may be readily identified and referred to on the rate sheets by its number.

Price of Lamps

On this sheet should be given a list of all standard lamps which are to be furnished free to consumers entitled to free lamps. In another column should be added the prices to consumers not entitled to free lamp renewals. On this page should also be given the prices of lamps under any other conditions which may exist. If special prices are made for the rental of arc lamps, fixtures, signs or other appliances, they should be added on this sheet.

RECOMMENDATIONS FOR ISSUING AND FILING SCHEDULES

The Committee recommends for the issuance and filing of schedules with the National Electric Light Association the following:

That member companies file their schedules with the National Electric Light Association, on or before September, 1912.

In the form of schedule, the Committee recommends that each sheet, composing a complete schedule, be issued as an original sheet to the particular schedule of which it is a part, and that each such sheet be numbered consecutively, commencing with No. 1, not counting the title page, and also that each sheet show the date of issue and effect. The Committee further recommends that, as occasion arises for a new sheet, it be substituted by showing at the top of the new sheet the same number, that it is 1st Revised Sheet No. —, and that it cancels the original sheet, and at the bottom of the new sheet the date of issue and effect of the sheet which it supersedes. In this way, schedules may be kept up-to-date with a minimum expense and a new schedule would be required only when an entire change is made.

Conforming to custom, the Committee suggests that when transmitting copies of schedules or amendments thereto for filing, they shall be accompanied by a letter in the following form:

....
(Name of Corporation)
(Date).........

Advice No.......
To the National Electric Light Association.

Accompanying schedule is sent to you for filing, in compliance with resolution adopted by the National Electric Light Association, June 14, 1912.

Schedule Blank Electric Co.
No..........
Effective 19

....
(Signature of Filing Agent)

Or, in case of filing a supplemental sheet to a contract, the following letter of transmittal:

....
(Name of Corporation)
(Date).........

Advice No.......
To the National Electric Light Association:

Accompanying supplement is sent to you for filing, in compliance with resolution adopted by the National Electric Light Association, June 14, 1912.

Sheet No. 5 to
Blank Electric Co.'s Schedule No. 1,
Effective December 1, 1912,
Superseding
Sheet No. 5,
Effective July 1, 1912.

....
(Signature of Filing Agent)

That the companies transmit such schedules or supplemental sheets in duplicate with a duplicate letter of transmittal, the Association to return one letter and schedule or supplemental sheet properly stamped to show that the schedule or supplemental sheet is on file.

The Committee further recommends that it is advisable that every company shall post in a conspicuous place, in its main office and in each of its branch offices, a notice to the effect that copies of the schedules of rates applying in the territory have been filed with the National Electric Light Association, and that they may be inspected at any of the offices of the company by any one desiring to do so.

Note—Street Lighting Contracts have not been considered by the Committee, the matter being left to next year's Committee. Member companies can, however, refer to the Report of the Rate Committee of the New England Section of the National Electric Light Association read in 1912.

Committee

E. W. Lloyd, *Chairman*
L. H. Conklin
S. E. Doane
R. S. Hale
A. S. Huey
J. D. Lyon
R. A. Philip
W. H. Winslow
W. J. Norton, *Secretary*

SUMMARY OF RECOMMENDATIONS CONTAINED IN THE 1912 REPORT OF THE RATE RESEARCH COMMITTEE

1. That the work of compiling all available electric rate information be pushed to an early completion and published.

2. That the plan of appointing member company assistants to the Rate Research Committee be continued, and that the weekly Rate Research Bulletin be sent to them, the expense to be arranged for by the Executive Committee.

3. That, in general, the Committee recommends either a Demand or a Straight Line Meter Charge for small business, and a charge based upon demand for large business.

4. That all Member Companies adopt the form of schedules recommended by the Committee and arrange to file and publish the same with the National Electric Light Association as soon as possible and not later than September, 1912.

This tariff is complete and
contains all effective changes.

BLANK ELECTRIC COMPANY

Schedule of Rates

for

ELECTRIC LIGHT AND POWER

(Here insert the territory which the company covers)

Original Schedule

Issued June 1, 1912 Effective July 1, 1912

Filed June 1, 1912 NATIONAL ELECTRIC LIGHT ASSOCIATION

Individual sheets issued and effective as noted thereon.

By JOHN DOE, *President*
60 MAIN STREET
CITY, STATE

CONTAINS 10 SHEETS AS NOTED IN THE TABLE OF CONTENTS ON SHEET NO. 1

FULL SIZE 8 IN. BY 11 IN.

TABLE OF CONTENTS

Sheet

BATTERY RATE, STORAGE.......... 5
CONTRACT RIDERS, STANDARD.......... 8–9
CONTENTS, TABLE OF.......... 1
DEFINITIONS, EXPLANATION OF TERMS AND.......... 7
EXPLANATION OF TERMS AND DEFINITIONS.......... 7
FEATURE RATES 5
GENERAL LIGHTING RATES.......... 2
LAMPS, PRICE OF..........10
LARGE LIGHT AND POWER RATE.......... 4
LIGHTING RATES, GENERAL.......... 2
LIGHTING RATES, LARGE.......... 4
POWER RATES, SMALL.......... 3
POWER RATES, LARGE.......... 4
PRICE OF LAMPS..........10
RATES:
    GENERAL 2
    SMALL POWER 3
    LARGE LIGHT AND POWER.......... 4
    STORAGE BATTERY 5
    FEATURE 5
RIDERS, STANDARD CONTRACT.......... 8–9
STANDARD CONTRACT RIDERS.......... 8–9
STORAGE BATTERY RATE.......... 5
TABLE OF CONTENTS.......... 1
TERMS, EXPLANATION OF, AND DEFINITIONS.......... 7

(DESCRIPTION TO FACE 1ST SHEET NO. 2)

EXPLANATION OF GENERAL RATE...A.

The general rate recommended on the opposite page is an alternate to the straight line meter rate shown on the following page. Either one is recommended by the Committee.

RATE. Numerous methods for estimating the DEMAND are used by various companies, general recommendations concerning which are made in the body of the report.

The following are typical examples of alternative methods actually in use by member companies and the last two are recommended by the Committee.

DEMAND INDICATORS AND ASSUMED DEMAND FOR SMALL CONSUMERS. "Maximum demand indicators will be installed by the company for the purpose of ascertaining the maximum demand except where the capacity of the consumer's installation is less than one kilowatt, in which case the maximum demand will be estimated" on the following basis:

A. Number of 50-watt lamps connected or their equivalent.
B. Kilowatt-hours at full rate per month (commercial customers).
C. Kilowatt-hours at full rate per month (residence customers).

A.	B.	C.	A.	B.	C.	A.	B.	C.	A.	B.	C.	A.	B.	C.
1	2	2	5	8	7	9	12	10	13	16	12	17	20	14
2	3	3	6	9	8	10	13	11	14	17	13	18	21	15
3	5	5	7	10	9	11	14	11	15	18	13	19	22	15
4	6	6	9	11	10	12	15	12	16	19	14			

or ESTIMATED DEMAND

Residence lighting; active load 60 per cent of the first 10 lamps of 50 watts equivalent connected, plus 33 1/3 per cent of all additional installation.

Stores, offices, restaurants, saloons, lodge and dance halls, laundries, depots, theaters, hall lights, active load 70 per cent of total connected load.

Factories, livery stables, churches, hotels, clubs, schools, shops, county and federal buildings; active load 55 per cent of total connected load.

Municipal Building lighting; active load 55 per cent of total connected load.

Signs and outlines; active load 100 per cent of total connected load.

or ROOM BASIS

.. cents per kilowatt-hour for the first .... kilowatt-hours per month for each active room.

.. cents per kilowatt-hour for all excess use.

All rooms except the following are counted as active; .... bedrooms, front halls, kitchens and vestibule.

or FLOOR AREA

First floor, each 1000 sq. ft. of floor area to be considered as ...... kilowatts of maximum demand.

Second floor, each 1000 sq. ft. of floor area to be considered as ...... kilowatts of maximum demand.

Third floor, same as second floor.

Basement and attic not included in floor space.

(ALTERNATE)

BLANK ELEC. CO., SCHEDULE NO. 1 ORIGINAL SHEET NO. 2

GENERAL RATE...A

CHARACTER OF SERVICE. This rate may be taken for any installation on which the company's service is used exclusively.

RATE. ...... cents per kilowatt-hour for the first ...... hours' use per month of maximum demand.

...... cents per kilowatt-hour for excess use.

Demand to be determined by demand indicator, or, at the option of the company, the demand may be estimated.

DISCOUNTS. ...... per cent discount allowed when bills are paid on or before ...... days from their respective dates.

MINIMUM CHARGE. ...... cents per month.

LAMP RENEWALS. (Here insert Standard practise.)

STANDARD RIDERS. Applicable to this contract, Numbers 1, 2, 6, 7, 8, 9, 11, 13.

TERM OF CONTRACT. Terminable by Consumer or Company on ...... days' written notice at Company's office.

DATE OF ISSUE JUNE 1, 1912 DATE EFFECTIVE JULY 1, 1912

ISSUED BY BLANK ELECTRIC COMPANY, 60 MAIN STREET, CITY, STATE

EXPLANATION OF GENERAL RATE...A.

The general rate consists of two alternate sheets, the first being a demand rate and the second a straight line meter rate. Either one is recommended by the Committee.

CHARACTER OF SERVICE. This, being a general rate, some simple description of its character should be used and the Committee recommends the form on the opposite page, the reference to the exclusive service protecting the company from the installation of auxiliary or breakdown service under the contract.

RATE. As an alternate to the straight line meter rate, a meter rate with block discount may be used as follows:

.... cents per kilowatt-hour for the first .... kilowatt-hours monthly.

.... cents per kilowatt-hour for the next .... kilowatt-hours monthly.

.... cents per kilowatt-hour for excess use.

The Committee in the body of the Report has recommended:

DISCOUNTS. That "retail rates quoted in schedules may be gross rates subject to a moderate cash discount for payment within fifteen days or less from date of bill. Giving half the cash discount during the succeeding ten days has been adopted by some companies and found to expedite collections and promote friendly relations with the consumer."

MINIMUM CHARGE. That "there should be an appropriate minimum charge per customer."

LAMP RENEWALS. That "it is for the best interest of Central Stations and the public that the rate for electricity should be such as to permit the free renewal of standard lamps and the offering of other lamps at such low prices as to prevent dealers from competing with inferior lamps; or, if this policy is not adopted the offering of lamps only at such prices as to encourage dealers to compete with a good quality of lamp."

GENERAL RATE....A.

CHARACTER OF SERVICE. This rate may be taken for any installation on which the company's service is used exclusively.

RATE. .... cents per kilowatt-hour for all energy consumed.

DISCOUNTS. ...... per cent discount allowed when bills are paid on or before ...... days from their respective dates.

MINIMUM CHARGE. ...... cents per month.

LAMP RENEWALS. (Here insert standard practise.) See Sheet No. 10.

STANDARD RIDERS. Applicable to this contract. Numbers 1, 2, 6, 7, 8, 9, 11, 13.

TERM OF CONTRACT. Terminable by Consumer or Company on ...... days' written notice at Company's office.

(DESCRIPTION TO FACE SHEET NO. 3)

EXPLANATION OF SMALL POWER RATE...B

CHARACTER OF SERVICE. The character of service and class of service should be defined by something more than the word "power," since cooking is no more power than lighting, according to the dictionaries.

The following is the only definition that has been submitted to the Committee:

Power is here defined as general motor service, cooking, heating, electroplating, charging storage batteries and similar service, but does not include the running of dynamos for electric lighting purposes.

RATE. As an alternative to the demand rate shown on the opposite page, a straight line meter rate with block discount may be used as follows:

...... cents per kilowatt-hour for the first ...... kilowatt-hours per month.

...... cents per kilowatt-hour for the next ...... kilowatt-hours per month.

...... cents per kilowatt-hour for excess use in any month.

Some companies may prefer to use an estimated demand instead of demand indicators in the demand rate shown on the opposite page.

An actual example used by a member company is as follows:

Active horse-power shall consist of a fixed percentage of the nominal rated capacity of the motor, as indicated on the manufacturer's name-plate. The following percentage of such capacity shall be deemed active:

Where installations are under 10 hp and only one motor is used	90 per cent
Where installations are under 10 hp and more than one motor is used	80 " "
Where installations are 10 hp or over and less than 20 hp, irrespective of number of motors	70 " "
*Where installations are 20 hp or over and less than 50 hp, irrespective of number of motors, yearly contract basis	60 " "
*Where installations are 50 hp or over and less than 100 hp, irrespective of number of motors, yearly contract basis	55 " "
*Where installations are over 100 hp, irrespective of number of motors, yearly contract basis	50 " "

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* Less than yearly contract basis, 70 per cent active.

SMALL POWER RATE...B

CHARACTER OF SERVICE. This rate may be taken for any power installation on which the Company's service is used exclusively. Power is defined as follows (see opposite page for a suggested definition):

RATE. ...... cents per kilowatt-hour for the first ...... hours' use per month of maximum demand.

...... cents per kilowatt-hour for the next ...... hours' use per month of maximum demand.

...... cents per kilowatt-hour for excess use.

DEMAND to be determined by demand indicators.

DISCOUNTS. ...... per cent discount allowed when bills are paid on or before ...... days from their respective dates.

MINIMUM CHARGE. ...... cents per month.

STANDARD RIDERS. Applicable to this contract, Numbers 1, 2, 3, 7, 8, 9, 11, 13.

TERM OF CONTRACT. Terminable by Consumer or Company on ...... days' written notice at the Company's office.

EXPLANATION OF LARGE LIGHT AND POWER RATE...C.

CHARACTER OF SERVICE. This is a general large light and power rate and its minimum primary charge per kilowatt protects the company, both as to small users and as to auxiliary or break-down service.

RATE. This rate being a general rate applicable to all large business and intended to cover all large users, it may at first glance appear to be complicated, and for this reason typical figures are introduced merely to more fully explain the schedule.

The Committee, in the body of its report, has recommended the following:

That "for large wholesale customers rates should be made on the Demand System with a measured demand and with quantity discounts so as to differentiate between customers of different sizes. The line of demarcation between large and small consumers should be drawn somewhere between $50 and $200 per month for light and somewhere between $10 and $100 per month for power."

MINIMUM CHARGE. The limitations mentioned on the opposite page need not necessarily be adopted; they are added merely to make a more comprehensive rate.

TERM OF CONTRACT. That "a guarantee of income be required in contracts which necessitate extensions to plant or lines and which the company considers might otherwise be unprofitable."

That "while recognizing the advantage in some cases of taking business on short-time contracts so as to be subject to termination on short notice, the Committee points out that long-term contracts are often desirable and necessary."

LARGE LIGHT AND POWER RATE...C.

CHARACTER OF SERVICE. This rate is applicable to electric energy used for any purpose.

Primary Charge

RATE. $60 per year per kilowatt for the first 25 of maximum demand kilowatts.

$40 per year per kilowatt for the next 25 kilowatts of maximum demand.

$36 per year per kilowatt for the next 50 kilowatts of demand.

$30 per year per kilowatt for any excess of maximum demand.

Secondary Charge

6 cents per kilowatt-hour for the first 1000 kilowatt-hours per month.

5 cents per kilowatt-hour for the next 1000 kilowatt-hours per month.

3 cents per kilowatt-hour for the next 3000 kilowatt-hours per month.

2 cents per kilowatt-hour for any excess use.

DEMAND to be determined by demand indicators or graphic meters.

DISCOUNTS. ...... per cent discount allowed when bills are paid on or before ...... days from their respective dates.

MINIMUM CHARGE. No bill shall be made for less than 25 kilowatts, of maximum demand.

The next to the last step in kilowatt and kilowatt-hours will not be allowed unless the customer signs an agreement to use at least 50 kilowatts until after one year's written notice to the Company.

The last step in kilowatts and kilowatts-hours will not be allowed unless the Consumer takes high tension, untransformed current.

TERM OF CONTRACT. ...... years with the privilege of cancelling at the end of the first year, only, upon payment of ...... per cent additional upon the amount of all bills rendered during the year under the contract.

EXPLANATION OF STORAGE BATTERY RATE...D

CHARACTER OF SERVICE. The Company should here state the exact classes of business that are allowed under this rate. The definition used on the opposite page is given for illustration merely. The Committee does not attempt to decide whether any particular class of use should get a lower rate than ordinary power, but merely wants to point out that there are classes of service which may properly be given lower rates than ordinary power. The Committee points out that the term "off peak" as applied to this class of contract should be discouraged. Such rates may be referred to as feature rates, or some permanent kind of service supplied under the rate may be selected for describing the rate, but in every case the exact description of the class of business entitled to the rate should be carefully given.

The use of the word "power" as including cooking and storage battery use is, for instance, the same kind of name selection as is the use of the term "Storage Battery Rate" to include cooking.

RATE. The Committee recognizes that in addition to the difference between lighting and power rates, conditions demand making a difference for other classes, even if the result is a different rate to customers of the same individual size and load-factor but using electric service for a different purpose, subject, however, to the condition that all such customers using electric service for the same purpose and under the same conditions should receive the same rate.

This principle, however, should not be applied to overcome the general principle that no rates should be made unless the final result in combination with other rates is for the advantage of the consumers as a whole.

NOTE—This rate as shown is composed of a demand charge plus kilowatt-hour charge. If a company prefers to omit the demand charge, increasing the kilowatt-hour charge correspondingly, the mode of construction of the rate is obvious.

STORAGE BATTERY RATE...D

CHARACTER OF SERVICE. This rate may be taken for any storage battery or similar installation for which the Company's service is used exclusively.

Similar use to storage battery use is defined as including motors used for refrigerating purposes, electroplating and heating.

Primary Charge

RATE. $...... per kilowatt per year for the first ...... kilowatts of maximum demand.

$...... per kilowatt per year for excess maximum demand.

Secondary Charge

...... cents per kilowatt-hour for the first ...... kilowatt-hours monthly.

...... cents per kilowatt-hour for the next ...... kilowatt-hours monthly.

...... cents per kilowatt-hour for any excess.

DISCOUNTS. ...... per cent discount allowed when bills are paid on or before ...... days from their respective dates.

MINIMUM CHARGE. No bills shall be made for less than ...... kilowatts.

STANDARD RIDERS. Applicable to this contract, Numbers 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13.

TERM OF CONTRACT. ...... years with the privilege of cancelling at the end of first year, only, upon payment of ...... per cent additional upon the amount of all bills rendered during the year under the contract.

EXPLANATION OF TERMS AND CONDITIONS

The Committee recommends that a general set of terms and conditions applicable to all contracts be used, and on the opposite page is given a sample terms and conditions used for all contracts, made up mainly from the terms and contracts adopted by one of the member companies.

The Committee, however, makes no recommendation for the general adoption of this particular set of terms and conditions.

The form of rates suggested by the Committee provides for giving the general rates only on installations that use the Company's service exclusively. The case sometimes arises that a customer takes the service for use exclusively and later puts in his own plant or makes a connection to some other plant, so that the company finds itself supplying breakdown service, but when it attempts to cut the service off on this account, or to make a minimum charge, there is trouble with the customer.

One Company avoids this difficulty by inserting the following clause in its terms and conditions:

> "If a customer, who is not paying a rate calling for an annual fixed cost, desires to use the electric service as auxiliary to another source of power (excluding, however, small sources of power not exceeding two horse-power), he may do so only by paying a minimum charge of $3.00 per month per kilowatt for as many kilowatts as it is possible for him to use on the service at any one time; this number to be determined by a circuit-breaker, so arranged as to disconnect the service if the number of kilowatts is exceeded."

TERMS AND CONDITIONS

For the purpose of determining the amount of electricity used, a meter shall be installed by the Company upon the Customer's premises, at a point most convenient for the Company's service, upon the reading of which meter all bills shall be calculated. If more than one meter is installed, unless for the Company's convenience, each meter shall be considered by itself in calculating the amount of the bill. When more than one meter or discount indicator is installed under this agreement, for the Company's convenience, the sums of the consumptions and demands shall, in all cases, be taken as the total consumption and demand.

All bills shall be due and payable upon presentation and shall be rendered monthly, unless either the Customer or the Company desires bills rendered weekly, in which case it may be done by adjusting to a weekly basis all the monthly figures referred to in the schedule of rates.

The Customer will be responsible for all charges for electricity furnished under this agreement until the end of the term thereof and for such further time as he may continue to take the service, except that where the Customer has the right to terminate the agreement by notice, which shall be in writing, he shall remain liable for all charges for ten days thereafter.

The Customer will be responsible for all damage to, or loss of, the Company's property located upon his premises unless occasioned by the Company's negligence.

The Company shall not be responsible for any failure to supply electricity, or for interruption or reversal of the supply, if such failure, interruption or reversal is without willful default or neglect on its part.

The Company reserves the right to install a circuit-breaker, so arranged as to disconnect the service in the premises, if the Company's capacity at that point is exceeded.

If lamps and care are supplied under this agreement, they will be supplied only for such installations as use the Company's electricity exclusively.

It is agreed that all lamps, plugs, meters and such other appliances as are furnished by the Company shall remain its property. And it is further agreed that all wiring upon the premises of the Customer to which the Company's service is to be connected, shall be so installed that the Company may carry out this contract, and shall be kept in proper condition by the Customer.

Permission is given the Company to enter the Customer's premises, at all times, for the purpose of inspecting and keeping in repair or removing any or all of its apparatus used in connection with the supply of electricity, and for said purpose the Customer hereby authorizes and requests his landlord, if any, to permit said Company to enter said premises.

The benefits and obligations of this agreement shall commence when the Company commences to supply electricity hereunder and shall inure to and be binding upon the successors and assigns, survivors and executors or administrators (as the case may be) of the original parties hereto, respectively, for the full term of this agreement.

No agent has power to make, modify or alter this agreement, or waive any of its conditions, or to bind the Company by making any promise or by accepting any representation or information not contained in the agreement.

The Company reserves the right to require a deposit not to exceed two months' estimated bill, where credit is found upon investigation to be unsatisfactory. Legal interest will be paid by the Company upon such deposits.

EXPLANATION OF TERMS AND DEFINITIONS

The ELECTRICAL UNIT of measure is ONE KILOWATT-HOUR and is usually designated 1 kw-hr.

One KILOWATT is 1000 watts.

One KILOWATT is equivalent, approximately, to 1 1/3 HORSE-POWER.

One HORSE-POWER-HOUR is equivalent to 746 watt-hours or .746 kilowatt-hours.

HORSE-POWER is designated hp.

CANDLE-POWER is designated cp.

DATE OF ISSUE JUNE 1, 1912 DATE EFFECTIVE JULY 1, 1912

ISSUED BY BLANK ELECTRIC COMPANY, 90 MAIN STREET, CITY, STATE

EXPLANATION OF STANDARD CONTRACT RIDERS

The Committee recommends that all riders applicable to any of the contracts be standardized and properly listed on this sheet. Conditions differ largely, however, throughout the country, and the riders given on the opposite page, in use by one of the member companies, have been selected as a typical set.

STANDARD CONTRACT RIDERS

1. TEMPORARY SERVICE.

It is further understood and agreed that as current is to be used for temporary purposes only, the undersigned agrees to pay in advance the sum of $............, as the cost of making the service connections.

2. PREPAYMENT.

It is further understood and agreed that as undersigned's premises are over 100 feet from the Electric Company's mains, or separated therefrom by serious obstacles, the undersigned agrees to pay a deposit of $............ for connection, against which bills for current to the amount of 50 per cent of such bills will be charged until the amount of deposit is refunded.

3. TERMINATION BY SALE OR LEASE.

It is agreed that in the event of the sale of the premises or the transfer, assignment or expiration of the lease thereof, this contract may be terminated by the customer on and by written notice given to the Electric Company not less than ten (10) days in advance of the time when the desired termination is to occur; such notice shall include the name or names of the party to whom such sale or transfer has been made.

4. TERMINATION PRIVILEGE.

It is further understood and agreed that this contract may be terminated by either of the contracting parties at the expiration of .... years from the date upon which it takes effect. The party desiring such termination shall give to the other party hereto 60 days' notice to that effect in writing. In the absence of such notice of termination, it is understood and agreed that this contract shall continue in force and effect for the full term herein stated.

5. YEARLY TERMINATION PRIVILEGE.

It is further understood and agreed that this contract may be terminated by either of the parties hereto by giving notice in writing to that effect ten (10) days before the termination of any yearly period from the date upon which the contract first became effective. In the absence of such notice, this contract shall be deemed to have been renewed for another period of not less than one year or for the full term herein agreed upon.

6. CONTRACT SUBSTITUTION.

It is further understood and agreed that any other of the Company's standard contracts, now existing or that may be adopted in the future, if of advantage to the undersigned, may be at any time substituted for this contract. Should such substitution be made during the first year, if desired by the undersigned, the new schedule shall be applied retroactively to the date of the connection of the service.

7. FUTURE RATE REDUCTIONS.

It is further understood and agreed that in the event of any general reduction in the prices of the Electric Company, made to Customers using current under like conditions, corresponding reduction shall be made in the terms of this contract as herein scheduled.

(*Standard Contract Riders continued on Sheet No.* 9)

STANDARD CONTRACT RIDERS—*Continued from Sheet No.* 8

8. CONTRACT SUBSTITUTION.

It is further understood and agreed that this contract, if of advantage to the undersigned at any time within its term, may be substituted by any standard schedule on the lower basis upon written notice to the Electric Company given not less than ten days in advance of the time of the desired change.

9. CONJUNCTIONAL SERVICE.

It is further understood and agreed that in view of the fact that the buildings enumerated in this contract are not more than 100 feet apart, are under a common ownership and may be served from one leasehold service, the current required for them may be taken collectively in determining the rate to which the undersigned is entitled under this contract.

10. SEGREGATED SERVICE.

It is further understood and agreed that this installation shall be supplied exclusively by the Electric Company, that a separate and independent connection to the service of the Electric Company shall be made and maintained and that this equipment shall not, at any time during the term of this contract, be supplied from any other service or source of electric current supply than that of the Electric Company.

11. MINIMUM PERIOD OF SERVICE.

It is further understood and agreed that the service of the Electric Company shall be used for a minimum period of three months, but failing to make use of the service for this minimum period, the cost of the service and meter connections shall be paid by the undersigned to the Electric Company.

12. GUARANTEE WAIVED DURING CONSTRUCTION.

It is understood and agreed that the usual guarantee shall be waived during the period of construction of this building and during partial occupancy, the first six months after completion. Such waived period, however, shall not extend beyond ....

13. BREAK-DOWN SERVICE.

In consideration of the maintenance of the service to be supplied under this contract as a reserve, auxiliary or breakdown to the private electric generating plant upon these premises, it is agreed that;

There shall be a Service Charge of Thirty Dollars ($30) annually for each kilowatt of maximum demand contracted for hereunder;

Within this Service Charge electric current may be consumed during any period of the year at the rates herein stipulated without additional cost to the undersigned;

For billing purposes this service is to be charged for monthly, pro-rata, at the rate of $2.50 for each kilowatt of maximum demand contracted for. The undersigned assumes full responsibility for the conjunctive operation of the private electric plant and the street service. The Electric Company is relieved of any responsibility therefor.

EXPLANATION OF THE PRICE OF LAMPS

Only suggested headings are given, as lamp practise varies greatly throughout the country.

Here should be listed, however, a description of the lamps and prices in use by each Company, together with any maintenance charges which may be used.

The Committee in the body of its report has made the following recommendation:

That "It is for the best interest of central stations and the public, that the rate for electricity should be such as to permit the free renewal of standard lamps and the offering of other lamps at such low prices as to prevent dealers competing with inferior lamps; or, if this policy is not adopted, the offering of lamps at such prices as to encourage dealers to compete with a good quality of lamp."

PRICE OF LAMPS

Size	Class	Customers Entitled to Free Renewals Price in Cents	Customers Not Entitled to Free Renewals Price in Cents

ARC LAMPS.

FIXTURES.

SIGNS,

ETC.

DISCUSSION

Mr. H. L. Wallau, Cleveland, Ohio: Three forms of residence rates are recommended by the committee:

1 A straight line rate system
2 A block rate system
3 A demand form of two-rate system

The advantages and disadvantages of the first two can be briefly outlined as follows:

STRAIGHT LINE RATE

Simplicity.

Minimum complication in billing, consequently fewest errors in billing, greatest speed and minimum billing cost.

Since this rate is of necessity an average rate, it is preferential to the consumer whose use of his demand is below the average, and detrimental to that consumer whose hours' use of demand is above the average; that is, the long-hour user is taxed enough to make up the loss on the short-hour user of the same class. Nothing in this rate encourages the use of auxiliary devices, which are very advantageous to the central station.

BLOCK RATE

Simple, and easily understood by the consumer.

Billing somewhat more complicated and therefore more expensive.

It is a step in the right direction, embodying an average consumer's charge and an average demand charge. Being based on averages it also favors the short-hour user at the expense of the long-hour user. While encouraging the use of auxiliary devices to some extent, the small consumer is less apt than the large consumer to get the lower rates carried in the schedule, since the first block of units is rarely passed in the case of the small consumer.

This will be an unpopular rate because the greater proportion of the residence consumers will get practically no benefit therefrom, in spite of the fact that a very large percentage of the residence consumption may be billed at the lower rates. That is, 60 per cent of the residence current may be sold at the high rate to 80 per cent of the residence consumers, only 20 per cent benefiting by the lower rates on the balance of the residence current sold.

TWO-RATE DEMAND SYSTEM

We come now to that system which can be made to most nearly approach the cost of rendering service as well as furnishing kilowatt hours.

Let us first assume that the demand as estimated by any system advocated is the true demand. Neglecting the practical limitations as to the actual figure to which the demand charge may be raised to obtain very small business on this system, it can readily be seen that such a schedule can be arranged so that the net rate per kw-hr. paid by the consumer is at all points equal to the cost of serving him, plus a fixed profit.

Owing to the fact that the demand charge on this class of business is generally high, it is inexpedient to apply it directly, so that in actual practise it takes the form of a block rate, with the important difference, however, that the block of high-rate units billed to any consumer is based on his demand. In this case also the demand charge is an average charge, but as pointed out above, the high-rate unit block is not an average block, but a block commensurate with the demand.

This form of rate is somewhat more difficult to explain to a consumer, requires some additional work in the billing department to establish the individual consumer's block of high-rate units, and is, therefore, subject to more billing errors than either of the previous systems. However, the rate follows the cost curve more closely than either of the other two, giving practically every consumer the benefit of the lower secondary rate during part or all of the year, and, therefore, greatly encouraging the use of profitable electrical conveniences.

At the beginning of the discussion on the two-rate system we assumed that the demand as estimated was the true demand.

Let us now consider four systems of arriving at this demand. How shall it be determined?

Our Committee recommends two:

Active room demand basis, and *Floor area demand basis.* Let us analyze these.

Two advantages stand out prominently for each—simplicity and unrestricted scope in the number and design of fixtures.

Some of the disadvantages follow.

Inflexibility—The demand is fixed by the number of active rooms, or by the floor space of the house. There is no way in which the demand can be changed to meet a consumer's conditions, so as to reduce his bills to meet his views somewhat more closely. The Active-room system further penalizes the man who builds his house with several active rooms, or, favors the man who builds the same size house with few active rooms. We have in mind three houses of practically the same floor area, one of which would have four, one five, and one six active rooms, and all of which would have practically the same number of outlets and the same candle-power installed.

Irrationality—They take absolutely no account of the connected load and therefore of the actual demand. Two houses with the same number of active rooms will have the same demand although the rooms of one may be twice as large as those of the other, and require twice the candle-power to illuminate them. Floor area is consequently more logical than the active-room basis. Two apartments, identical in all respects as to floor area and number of active rooms, will have the same demand although the color scheme of the decorations in one may be such as to require 50 per cent more candle-power than is needed in the other.

In the above discussion it is assumed that unwired rooms will not be included in either method of determining demands.

Active-room socket demand system—This name may be applied to the system in use in Cleveland. In this system, the total number of sockets in the active-room fixtures is counted, and a percentage of the number of these sockets is taken as the equivalent number of 50-watt lamps, constituting the demand. All outlets in non-active rooms, and all auxiliary devices are left out of the demand.

This system, we believe to be more equitable than either of the other two. It is, however, far from infallible. Its principal advantage lies in the fact that the householder can by modifying his fixtures, modify his demand, and thereby earn a better rate. Being based on 50 watts per rated socket, the high-efficiency units so largely used now do not have the effect of reducing the initial block of high-rate units, the consumption only being reduced; the average rate per kw-hr. consumed is therefore higher when using the same candle-power hours in tungsten instead of in carbon lamps, although the net bill is lower.

It has the disadvantage that the installation must be checked occasionally to determine whether changes in fixtures have modified the demand or not, and an increased demand always causes a protest, although the increase can usually be justified.

It has the further disadvantage that a consumer wiring his premises with a few outlets for high candle-power, high-efficiency units, obtains a lower demand than his neighbor with the same candle-power in a larger number of small units, but this class of wiring is not often met with. Like the active-room system, it does not fit the case of the incompletely wired residence where all outlets are located in inactive rooms, which theoretically means zero demand, and in practise is not applied to this condition.

Demand indicator basis—This last we believe to be the true basis on which eventually all residence rate schedules will be based. Some of us live in hope that the day is not far distant when such a device will be available at a price sufficiently low to place it on the premises of the smallest consumer. Pending this happy state of affairs, some arbitrary means of estimating the demand must be employed and while recognizing the time and thought put upon the systems recommended by our Committee, and the vast amount of unselfish work it has done in preparing this very comprehensive report, yet, we beg leave to take issue with the Committee on the points discussed.

Summarizing, it is safe to assume that an unwired room should not be included in any scheme for estimating demand. It follows, therefore, that just as frequent periodic inspection is required to determine whether additional rooms have been wired, or been changed from inactive into active rooms, as to determine whether or not fixtures have been changed. On this score, there is no preference among the methods recommended.

The active-room socket-demand system, by its greater flexibility, does permit a person who moves into an extravagantly lamped house to reduce his block of high-rate units by removing or modifying fixtures, thereby making his lighting bill more in keeping with his income. No such change can be effected with the systems recommended.

The candle-power required to properly light a room depends upon the following items:

1 Size of room
2 Color scheme of decorations
3 Reflecting qualities of furniture

4 Use to which room is put
5 Brilliancy of illumination desired by occupants
6 Use of table lamps or special fixtures for furnishing local concentrated illumination for specific purposes

The active-room demand system recognizes only one—use.

The floor-area demand system recognizes only tow—size and use.

The active-room socket-demand system recognizes the entire list. Is it not much more logical?

The active-room and floor-area systems may appeal to the central-station manager as easily applied, but should this single consideration outweigh the many injustices such systems are bound to work on the consumer?

To further illustrate the position of the consumer, I will take the liberty of reading a letter received by our Company from a young woman newspaper correspondent, who is on the staff of the Cleveland *News:*

> DEAR SIRS:
>
> I want to protest,a little about the rates you have made for our lighting at Noble Road, eleven units at 10 cents a unit. I know there are a good many lamps in the house, but we did not put them there (the place is rented by us) and we don't use any more light than we did in other places where we have lived and had your service. There are only two people in our family, and I do feel that the rate is rather extravagant for us. I believe you will think so too, if you will refer to our bills for .... Marlowe Ave. and .... Street.
>
> Here is another point: I have been interested in the thought of supplying our household with a number of electrical appliances to save time and labor; but when our rate is so high I would not feel like using current in this way. I had hoped to invest in a new electric stove, and have had my eye on a vacuum sweeper—in short, I have been wanting an "electric household"—but don't you see that a high rate is prohibitive?
>
> Please see if you can't adjust the matter a little more according to *us* and not to the number of lamps in the house—lamps which we don't use and don't want—so that we may feel free to introduce some of the electric servants into our home.

Our system enabled us to go through and disconnect the useless fixtures or excess arms on fixtures, disconnecting the wires on the inside without spoiling the fixture, and leaving the proper connections in place for such lamps as were necessary; had our system been the active-room demand system without the socket modification, this would have been impossible.

Another rate advocated by our Committee for the very small consumer is the straight demand rate with the use of a current-limiting device. I know that in Ohio the State Commission will not permit such a device to be installed. The chairman of the Ohio Commission made that statement very positively. Whether other Commissions will take that viewpoint or not is uncertain.

I also notice that in the table referring to the measurement of demand, it is stated that demand should be measured in all cases except where the installation is less than one kilowatt. The Rate Research Committee evidently believes that demand indicators, good for ten ampere meters, are available at a sufficiently low price; perhaps it will not be very long before they are available for five amperes at a lower price.

MR. ARTHUR WILLIAMS, New York City: I wish to congratulate the Rate Research Committee upon having made an upward step in connection with a question upon which I believe we have been very backward for a long time. I think that the aims of the Committee are very commendable, and that I express the unanimous opinion of our Association when I say that we should have, in addition to a very comprehensive statement of the rate situation as it affects our prices, a fuller knowledge of the principles which underlie the making of rates. I therefore repeat that I consider this report a very important step in advance. Recalling the difficulties that naturally confront a committee undertaking a discussion of this question, I think that our Committee of this year is to be highly congratulated upon the results that it has achieved. I take it that this report is to be viewed somewhat in line with the one of last year; that it is to be looked upon as a second step toward a final report upon which we can hold unanimous views and which can be adopted by the Association as a whole.

If I were asked to make a slight criticism of this report it would be that the principle of maximum demand, as a basis of charge, has been given too much emphasis. I think I am within the facts when I say that any maximum demand system, whether based upon the true maximum, or upon an assumed maximum derived from the connected installation, is a restrictive system. That is to say, in theory, and if carried out in practise, it places a premium upon convenience lighting, upon decorative lighting and upon the use of auxiliary electrical apparatus, unless some special provision is made for such apparatus. I think that this fact should be borne in mind.

The company with which I am connected—The New York Edison Company—employs the maximum demand system of charging to some extent. It finds this method desirable in connection with certain kinds of business and in certain parts of its territory. In other words, the company employs the maximum demand principle whenever this method seems to be the best for the consumer's interests; and it relies upon the so-called flat meter rate in other cases where that system seems to offer a more desirable method of charging for current. In past years we have employed the maximum demand principle of charging, in the sense of taking the connected installation as determining the maximum demand, and I think I am safe in saying that if you were to ask the representatives of the company who come in contact with the public in any way on the rate question, eliminating certain special conditions, the unanimous reply would be that for simplicity, directness and the ease with which the flat kilowatt-hour rate can be understood, this method has a great many intrinsic advantages. At the same time I do not for a single moment suggest that the experience or feeling of the men in New York who come in contact with this question should in the slightest degree control the views of those in other parts of the country, where entirely different local conditions may exist.

There is one recommendation in the report which I am frank to say I see no reason for placing there. I have tried to the best of my ability to find the slightest justification for basing the price of electrical energy upon the floor area or upon the number of rooms in a house; and I am hopeful that the Committee upon further investigation will remove such a recommendation from its report. There is no relation whatever between the amount of service a customer requires, or between the cost of rendering that service, or the income to be derived from using the service, and the number of rooms or the floor area occupied by the customer. There is no more relation, and perhaps not as much, as there is between a customer's electrical service and the number of trolley cars that may pass by his door in the course of each twenty-four hours. I therefore hope, gentlemen and Mr. President, that this recommendation, for the sake of the standing of our Association, will be taken out of the report before it is finally adopted. [Applause.]

The report makes a very commendable recommendation with reference to the filing of schedules. The public we are serving is entitled to know all of the rates made by the company. This, in my opinion, is but a matter of equity, fair dealing and good business policy.

As to the riders, I heartily agree that those attached to the contract should be treated as a part of the schedule. However, I would commend to the committee a careful study of these riders, and perhaps it might be well to have them considered by the general counsel of the Association. If you take the rider appearing under the heading "Original Sheet No. 8" calling for contract substitution, you will see that if you make a rate, say, in July, a customer having that rider could require the new rate to be made retroactive for an entire year. This is a detail, but it is important, and I would therefore suggest that these riders be given very careful consideration.

I would suggest in conclusion that our Committee as a committee refrain from officially recommending any particular system of rates, exactly as it would refrain from recommending the adoption of any particular type of apparatus. Such a recommendation might become a source of embarrassment to some of our member companies, which would surely be very undesirable. For example, on page 197, under the heading "Large consumer, lighting and power," a very definite recommendation is made, namely, a block rate with separate demand and energy charges. Many of our companies do not employ this system, and the recommendation, if adopted, might place them in a bad light before the public or before a commission. Instead of recommending a definite rate and method of charge, would it not be well to point out that rates are to be divided generally into two classes: One based upon averages, which is very similar to the five-cent fare of a street railway system; the other being the one under which we try to make each customer, so far as may be practicable, pay a certain percentage of our fixed charges. In other words, we want one class in which the individual consumer is looked to to pay all costs of rendering the service and a fair percentage of profit upon the investment; and another class in which the consumer pays upon an average basis. Beyond this, the selection of individual rates should be left to the judgment of the local company. [Applause.]

Mr. P. S. Josselyn, Portland, Oregon: In the discussion of this paper the gentleman from Cleveland spoke of counting the number of lights in a residence, and then taking a certain percentage of the number, from which to establish the maximum demand. I think it would be very interesting to some of us in the West who do not frequently come in contact with Eastern people to know what that percentage of actual count is which is used in the estimating of the maximum demand in residences.

Mr. Wallau: I may say that properly speaking, it is about 25 per cent of the connected load, although it is not ascertained in that way. The method by which it is ascertained is as follows: The number of sockets located in the active rooms is counted; and when there are one or more baseboard plugs per active room then these are counted also. We have assumed arbitrarily that 70 per cent of the lamps installed in these sockets are 50-watt lamps and 30 per cent are 25-watt lamps which is the equivalent to saying that 85 per cent of the sockets contain 50-watt lamps. Four-tenths, then, of this number of standard lamps is taken as the demand, other lamps and appliances in various parts of the house not being included. So we have four-tenths of 85 per cent of the sockets in the active rooms practically constituting the demand. In practise, as I have stated, it amounts to about 25 per cent of the connected load, including irons and things of that kind. This percentage we find to be the actual demand at the substations on our feeder system. I have made a number of tests from year to year, and the percentage has always been from 25 to 27 per cent, which is a very fair check on our rating system. [Applause.] The method of rating follows in detail.

The Illuminating Company's rates for electricity to residences are: 10 cents per unit until a use has been made equivalent to burning all of the lamps composing the "Residence Rating," 36 hours in each month, and 5 cents per unit for the electricity used in excess of that amount.

As in any other meter system you pay for only the actual current used. The thirty-six hours simply specifies the amount of electricity to be used at the regular rate (10 cents) before the 5 cent rate applies.

Record of lamps and receptacles affecting "Residence Rating":

LOCATED IN	Lamps	Receptacles	LOCATED IN	Lamps	Receptacles
Front Halls Main Stairway			—Reception Rooms		
Library Den			Dining Room		
Sitting Room			Sewing Room Children's Room		
Music Room Conservatory			—Bed Rooms		
Kitchen			TOTAL		

Of these lamps 7-10 are rated as 50 watt and 8-10 as 25 watt lamps.

This record reported by our inspector is equivalent to ...... standard 50-watt lamps.

Of these .... lamps, 4-10ths only are rated, hence your "Residence Rating" is ...... standard lamps, which in one hour will use .... watts, or .... kilowatts, your demand; and in 36 hours, ... kilowatt hours, or .... units.

Memorandum of lamps, fans, heating and cooking appliances, flat irons, charging sets, etc., which do not affect the rating.

LOCATED IN	Lamps	Receptacles	LOCATED IN	Lamps	Receptacles
Vestibule Porch			Pantries Summer Kitchen		
—Closets			—Servant's Room		
Bath Room Lavatories			Back Halls Back Stairways		
Dressing Rooms			Billiard Room Ball Room		
Attic Basement			Barn Yard		

In making your monthly bills therefore, the Company will charge you 10 cents per unit for any current used up to .... units. Any current used beyond .... units in a month will be charged at 5 cents per unit, a discount of 50 per cent.

One receptacle per room will not affect the rating; all in excess of this number will be rated at 50 watts each.

MR. J. W. LIEB, JR., New York City: The Rate Research Committee is to be heartily congratulated on this forward move which it has made in endeavoring to solve a most intricate and difficult question. It has wisely proceeded along the lines in which it is quite necessary to advance in any attempt at standardization. The first step in standardizing diverse practise is to select limits of variation which are wide enough to include all of the elements that are considered satisfactory in existing practise. Later, as practise improves, and its refinement increases, it becomes possible to narrow the limits, and apply restrictive conditions so as to gradually eliminate the fringes, as it were, and consolidate the practise eventually into the narrowest limits. Your Committee has endeavored to do this, perhaps not as broadly as might have been possible, but on the whole with fair liberality, considering every difficulty and the greatly diversified conditions which it has been the endeavor to cover. In considering, for instance, the division of rate forms as applied to classes of consumers, as outlined on page 197 of the Committee's Report, it has seen fit to add to the printed recommendation that the rate for large consumers of light and power be a block rate making separate demand and energy charges, the further recommendation that under proper local conditions a system of rates based on quantity of consumption may be desirable. It is quite necessary to cover in the recommendations what is considered the best practise through a very wide range of conditions, and it is hoped that the Rate Research Committee in its further work will have this in mind; because, after all, the question of proper rates is not merely an economic question; it is also a geographical question, and often a political question; and, therefore, having in mind that it is often a question of local conditions, these should be taken care of and provided for in recommendations involving the adoption of any new rate schedules.

Mr. Williams has emphasized, as has the Committee, the importance of filing rate schedules. That is a practise which has obtained for many years with the larger companies and has now become a requirement with the assumption of authority by Commissions; it is a practise wholly to be commended, and there is nothing which will establish and maintain confidence between the company and its customers so much as the publication of its rate schedules, and the assurance to the public that these schedules are adhered to, and that all customers are treated alike and are given the same rate under the same service conditions.

The matter of rates, and especially residence rates, is in the same chaotic condition abroad as it is in this country; and if you wish to have a side-light on what the situation is abroad, you can see it reflected in the last bulletin of the Institution of Electrical Engineers of Great Britain, before which a very extended discussion was had, in which the whole question of residence tariffs was gone into with great detail. It appears that the same diversity of opinion has existed abroad as here and is likely to continue where so many different conditions have to be met.

Referring to the block system, as it is defined on page 197 there is an important feature of the block system which has not been referred to specifically in this discussion, but which is in fact involved in this system. In establishing the charge for each block of units, with a maximum charge for the first block, a lower rate for the next block and a still lower rate for the next, and so on for succeeding blocks, we have involved, substantially, the application of the underlying principle of the maximum demand system applied on the basis of the average use of the demand, with the highest proportion of fixed charges in the first block, diminishing gradually in the second, third and succeeding blocks. So, after all, in applying even a block system we have in it a factor, which, although not numerically expressed, is still founded upon the fundamental principle of the maximum demand or multi-rate system. Of course, we all recognize that in order to approach this general subject we have to make our fundamental analysis of costs and approach it from a consideration of the cost of service into fixed charges and running costs. After such an analysis of cost of service is made, the doctrine of class averages can well be applied in establishing the proper class rates. I believe, therefore, your Committee should be heartily commended in its work which involves great labor and careful investigation; and we hope that it will continue in the future to give us in such admirable form the result of its labors. [Applause.]

Mr. Samuel Insull, Chicago, Ill.: I had not the pleasure of hearing all of the discussion or the reading of the report, as I was out of the room, but I caught some of the remarks made by my friend, Mr. Williams. If I understood him correctly, he thought the most satisfactory basis of rates would be one more nearly amounting to the five-cent railroad rate for urban transportation. Am I correct?

Mr. Williams: I think, Mr. President, that Mr. Insull did not quite catch my meaning. I suggested that the committee in its future work should point out that the rates and rate methods employed by the different companies to-day divide naturally into two classes: One in which the underlying principle is to conduct all of the business on the basis of average return, average cost, average profit, average everything; exactly as the railroad companies of our cities charging a five-cent fare, conduct their business on an average of cost and of return. Thus, in a city such as New York, you can ride two blocks or thirty blocks for a nickel, or you can ride twenty-five miles for the same nickel. With the second class, the effort is to place upon the individual consumer in each instance his own fair share of the cost of rendering the service. After making these two divisions, into which all rate schedules fall, let us leave it to the judgment of the local management which of the two methods shall be adopted, or whether both shall be adopted.

Mr. Insull: Taking Mr. Williams' explanation, the one method would be to get at average results in the way urban transportation is managed, namely, on the nickel basis, and that I do not like. If it were necessary to prove the erroneous basis of any such calculation, I do not know of a better example than to take the case of some railroad rates, and point out to you how absurd it would be to carry a pound of pig iron and a pound of feathers at the same rate.

Fundamentally, our business is based upon the return we can get on the dollar invested. That is the fundamental principle underlying our business. There is no other way of arriving at a proper return on the dollar invested than by selling your product on a system of rates that takes into consideration the points controlling the investment of the dollar; and so far as I know, no system of average rates so far devised takes into consideration that question of investment. The only possible way that you can take into consideration, that you can control, the investment you will have to make to take care of a given amount of business, is by a system of rates that have for their basis the demand for energy, which, after all, is the controlling point in the money you have to invest in your generating and distributing plants.

I do not agree with Mr. Lieb that this is in any sense a political question; it is a purely economic question; and if any particular number of companies have approached this subject of their rates from the point of view of the political exigencies of the moment, they must finally, in my judgment, change. The only true basis of our rates is the question of the demand on our investment, the question that controls is the amount of money that shall be employed in our business. Early in the business we unconsciously recognized this principle, in the days when we used to charge twenty cents a kilowatt-hour for our energy, and we put wholesale rates into operation. We wanted to prove our rate curve and did not exactly know how to get at it; but we looked for the long-hour user of energy and unconsciously adopted a rate based on the demand.

Take the experience of the large sellers of energy in this country, and where do we find the largest number of small customers in proportion to population? In the cities where they have a straight rate for energy or in the cities where they have two rates, one to cover the readiness to serve, and the other to cover the units used? You have simply to study the statistics of the various companies throughout this country, to be forced to the conclusion that it is an economic question fundamental to our business; and if you adopt the other course, if you adopt a straight rate for energy, ultimately, in my judgment, you are going to be forced to sell all your energy at that rate, whether you have a one-hour user like a small light customer in a flat, or whether you have a twenty-four-hour user like a contractor who takes your energy for pumping in some construction work underground. [Applause.]

MR. DOUGLASS BURNETT, Baltimore, Md.: It seems to me that the great value of this report to the membership at large is in the recommendation that rates be filed with the National Electric Light Association. I think nothing better can be done at the present moment to standardize conditions in our industry than to have the companies operating in each territory file their rates with some central body; and I suggest the National Electric Light Association headquarters for that purpose.

You who have no printed schedules of rates will find, if you undertake to do it, that the mere formulation of your rates on paper, and the filing of them with a central body will be of great value to you in your local situation. I can possibly best illustrate that by saying that when the Baltimore Company formulated and printed its rates it felt a great sense of satisfaction that it had accomplished a step in advance and it filed the rates with the city authorities. The result of this was that after a year or two, when the Public Service Commission of Maryland was formed, the company could readily take the position with the people that the rates and practises of the company were standardized, and that in fact a Public Service Commission was not needed.

Various questions which have arisen before the Public Service Commission of Maryland have been the more readily settled by the ability of the company to refer to schedules of rates that were filed with the public authorities even before the Commission was formed. The point is that the mere formulation of the rates, and their filing with the public authorities, causes a feeling of stability in the work of the company in its territory and in its dealings with customers.

Just one word on this question of diversity of opinion. There is very little reason for it. Mr. Lieb has indicated that in the quantity rate, or the block rate that is in force in the New York Company you have the elements of the demand rate. In some of those places where the demand rate is applied, it is expressed as a block rate. In the case of the Baltimore Company, while we have a two-rate schedule with a primary rate and a secondary rate for all excess consumption after a certain number of hours' monthly use of the demand, yet it appears to the customer strictly as a quantity rate, and each of the ninety per cent of the customers is billed in the form of a quantity rate. For instance, residences pay ten cents a kilowatt-hour for the first fifty kilowatt-hours a month, and five cents a kilowatt-hour for the excess; the entries on the ledger and in the individual bills are in the shape of a quantity rate. I think we are very likely to be under the wrong impression that rate systems are confusing. The various rates which take into account the active rooms and the square feet of floor area can all be expressed numerically in the shape of a two-rate system; they can all be expressed in the shape of a quantity system, when it comes to applying them to individual customers; and I think we should not take the discussion of Mr. Wallau, for instance, as indicating there is any confusion about the matter. If each of us would take the rates we use and convert them into other kinds of rates, a quantity rate, for instance, or a demand rate or the active-room rate, we would find it not such a difficult proposition. If we all study this matter for a year or two more we shall be able to reconcile these differences of opinion without much trouble. [Applause.]

MR. JOHN R. GRAHAM, Bangor, Me.: It has occurred to me, gentlemen, after hearing the different addresses of the session about prices for electric current, that you may be interested in my company in Maine, which has worked out a system now in operation three or four years with no complaints. The rate charged by this company for lighting runs from 25 cents per kw-hr. down to 3½ cents. Twenty-five cents per kw is applied as a summer rate, current being used for about three months during the year. That high rate is applied for the summer business to cover the fixed charges for the other nine months.

We charge a high rate for the first hour's use in each day and a low rate for the balance of the current used during the month. This last method automatically divides customers into two classes and places upon each its proper share of the fixed charges and operating expenses. We take the connected load on a 16 c.p. basis and charge 1500 watts per lamp; then we divide that into halves and charge 15 cents per kw. for the first hour's burning and 6 cents for the balance. That would make a charge for two hours' burning of about 10 cents per kw. and for four or five hours' burning during the day the price would be close to 6 cents. Under this system those who have a large installation and use a small amount of current have to pay a high rate and those having a small installation and using a large amount of current have to pay a low rate. The average rate for current under this plan for an average month at the consumer's meter is 7½ cents per kw.

We also have a hotel rate of 3½ cents per kw. A hotel cannot control its lamps. The current is turned on and burns all night in the bath rooms, and in other ways the lamps are left burning and the hotel has to pay for it, so they ought to have a low rate. A good deal of it comes on the off-peak load.

We have another rate which is used in dry goods stores where there is nearly all-day lighting, and instead of rating them 1500 watts per lamp we make it down as low as 500 watts, hence their price is 6 cents per kw.

We also sell power for manufacturing purposes. We make a maximum demand charge of $12 per hp. per year, which covers the interest charges for the installation of the machinery and we are prepared to furnish 3000 hp. at any time. We then make a charge for the operation ranging from $.002 down to $.001, according to the amount taken, which with the stand-by charge would average about $.004 per hp-hr. The $12 per hp. per year is paid whether we furnish current or not. This is 24-hour power and 80 per cent load-factor, so I conclude after a careful study of all the rate charges for power, that the proper method of charging is by demand.

The cost of electric service is made up of two distinct elements—the fixed charges which go on regardless of operation and the operating expenses which vary with the amount of current produced.

MR. P. JUNKERSFELD, Chicago, Ill.: I would like to express my appreciation of the admirable report which we have heard, and also of Mr. Wallau's comments thereon, but shall confine myself to the subsequent discussion.

First, whether or not the demand system is proper depends, ultimately, in my judgment, on whether you consider that this business is rapidly approaching, or is perhaps past, the time when rates should be based upon what the traffic will bear, or whether it has reached the stage in which the service rendered should be charged for on a basis proportionate to cost. Public Service Commissions and other regulative bodies will certainly take the latter viewpoint.

As an illustration along the line of residence lighting, I ask any of you whether you think it would be fair to make the same rate per kilowatt-hour, assuming now a straight meter rate, for a single man who has a private apartment and who is perhaps travelling three-fourths of his time, that you would for a family which is at home all the time and which perhaps uses a good many appliances? What element in the cost of supplying these two customers is proportionate to the number of kilowatt-hours used? Primarily fuel—a very small part of the total. Moreover, the straight meter rate, with the small customer using tungsten lamps, is proportionate to only a small part of the total cost; say, ninety per cent of the total cost in that case is a fixed charge on the investment and the fixed expense to carry that customer on the books, and, perhaps, only ten per cent varies with the amount of fuel and labor required to operate and maintain the plant and distribution system. So that, as a matter of fact, at the present time, the flat rate per outlet would in some cases be just about as fair as a straight meter rate. Of course, we all hope with the number of appliances coming in, that they will very rapidly increase consumption, and that this is only a temporary condition. I point to this as an illustration, that a straight meter rate is not at all proportional to the cost.

There is one thing to guard against in applying the demand system. If you want to get the long-hour business, and you must get the long-hour business to put you into a position where you can reduce the retail rates, you must be careful and not require too many hours' use at a high rate portion. In other words, if you ask a customer to pay for sixty hours' use at the high rate portion, he rarely or never enjoys the low rate; and therefore, thirty hours' use or thereabout would be very much better, as it would give residence consumers an opportunity to secure a certain portion of their service at the low rate. Moreover, unless you do that you give no encouragement whatever to the use of heating devices. The tendency, in my judgment, should be to fix not more than thirty hours as the high rate portion of the bill and to make a considerable difference between the high rate and the low rate, so that the rate for heating devices will come within the reach of the average residence customer.

I would like also to say one word upon the question of the comparison between rates for electric lighting, and rates for street car service. If there is one thing I hope for the National Electric Light Association, it is that our rates will not get us into the position of the urban and interurban railroad companies to-day. [Laughter and applause.] I refer you to any of the executive officers of the American Electric Railway Association, and particularly to the work they have been doing for three years or more, in educating the public and educating themselves upon the question of charging for their service on the street car system according the length of the ride. The result of that educational campaign on legislation during the last two or three years in many places in the country, has been the zone system of charging, which is quite prevalent in Europe, and toward which there is now a marked tendency in this country. The zone system charge is in many respects analogous to the demand system. In other words, it is a determined effort to charge on a basis approximately proportionate to the cost of the service.

MR. R. H. BALLARD, Los Angeles, Cal.: While we all, I think, recognize the absolute justice in the making of rates based on a maximum demand system, it is to my mind a question whether, for the residence consumer, or the small consumer, we could adopt a demand system in Southern California at this time. I believe firmly if such a system were adopted as a standard system of this Association, that political conditions in Southern California would not permit of its adoption just now. Mr. Insull has stated that the making of rates is not a political question, but rather an economic question. On that I agree with him. That is to say, the making of rates should not be a political question but should rather be an economic question; and rates should be fixed in proportion to the cost of furnishing each class of service. Unfortunately however, for us, the rate-fixing body is elected by the small consumer. The "small consumer" is largely in the majority and most of them are voters, who elect the councilmen. The council fixes a rate which it thinks will please the great majority of the voters, that is, the "small consumer," and the rate sticks. If the rate is not pleasing to them, the councilmen may be recalled under the charter; or, if they think the crime is not serious enough for a recall, they can, by petition, get out a referendum, and fix the rate to suit themselves. For that reason, it seems to me that at this time, conditions, in Southern California at least, demand some form of average rates; and the system now in effect is probably the best system of averaging that can be devised. In other words, the system is in effect the block system. The City Council in Los Angeles has just completed legislation fixing the rates for electric lighting service. They do not differentiate as yet between the small and the large consumer. The rate on the block system starts with a maximum of 6.5 cents per kilowatt-hour; and the rates then follow down with 100, 250, 500, 1000 and 5000 kilowatt-hour blocks, to the lowest rate of about 2 cents—I think it is 2.4 cents per kilowatt-hour. The block system, with which we are all familiar, makes it necessary for the consumer enjoying the very lowest rate of 2.4 cents per kilowatt-hour to pay his proportion of the high rate of 6.5 cents per kilowatt-hour.

Another thing that occurs to me in regard to the demand system, is it not after all to some degree an average system? We saw yesterday a chart by Mr. Freeman, exhibited in connection with his talk, and if I remember correctly, some consumers at the top of the page should have paid a rate of 7.41 cents per kilowatt-hour, other consumers lower rates, and the average was about 4 cents per kilowatt-hour. So that even on the demand system it seems that expediency makes it necessary to employ the average to some degree.

An objection that we make to the rates as recommended by the committee in this very excellent and comprehensive report is that it apparently does not take into consideration the business to be gained through or during off-peak hours; and I have in mind now the business that may be gained in the very early morning hours, between, say, midnight and six o'clock in the morning. In our country there is a great deal of business to be developed during those six hours. We can sometimes get hold of a man whose installation will apparently prove more economical if operated independently than by power at rates regularly laid down; but by re-arranging his own apparatus and equipment, sometimes and quite often, it is possible to get his whole business by allowing him a very low rate in the valley load, so-called, between twelve o'clock midnight, and six o'clock in the morning, and higher rates for different periods of the day. We have some contracts which provide for three rates, a rate for consumption between midnight and six o'clock in the morning; a higher rate for consumption between six o'clock and four-thirty in the afternoon; and a still higher rate for consumption between four-thirty in the afternoon and up to, say, eight-thirty or nine o'clock in the evening. That business, under our system, is very profitable and very desirable; and I would not like to see any rate schedule adopted which would overlook the possibility of securing business operating during the hours that the company may need it. Personally, I would be very much opposed to the final schedule, which is practically a flat rate for very small residence consumers. I do not believe that any form of flat rate can be adopted which will not lead to abuse on the part of the customer.

In general, our conditions seem to indicate that it would be necessary to divide the business into two general classes; the large business and the small business; and on the large business I do not believe we would have any difficulty whatever in adopting and carrying out a maximum demand system which would be thoroughly understood by the consumer, their power bills being large enough to make it worth their while to figure it out.

On the residence consumer, however, and the small business, I do not see the advantage or necessity of figuring out the maximum demand on the basis of floor area, connected load, or any such method. The average residence consumer would not have a maximum demand of over one kilowatt. On a block system charging the maximum rate for the first hundred hours' use, a greater number of hours would apply than were the consumer put on a maximum demand system strictly.

Another feature that would appeal very strongly to us in adopting or fixing rate schedules is that the rates should be fixed absolutely by the governing body, the Commission or Council, so as to leave no chance for argument between the company and the consumer. Hours use of connected load, and things of that kind will very often bring the company's representatives and customers into arguments as to the proper amount of charge, as to the correct figuring of floor area, the correct statement of installation, and so forth. Since we have come under very strict regulation, we have found one of the advantages to be that disputes with consumers are almost entirely eliminated, the consumer looking to the governing body to fix a rate satisfactory to him. Instead of disputing with the company most of the customers come in with the air of having the laugh on the company for being compelled to accept such low rates. [Laughter.]

Mr. E. Douglas, Milwaukee, Wis.: I want to say a word in favor of the demand system as a basis of assessing payments for residence electric business. As Mr. Insull has very properly said, the largest part of the cost of supplying electric service arises from the fixed charges on the investment. I think, gentlemen, you will agree that the kilowatt-hour is not the true measure of the necessary investment to supply electric service. [Applause.] In analyzing our costs, no doubt the unit "kilowatt-year" is preferable to the unit "kilowatt-hour." The Company with which I have been connected has during the last year and a half been operating on a residence lighting schedule which is based upon the demand system of charging. By assuming a relation between the number of rooms in a residence and the watts demand per room it is not difficult to develop the number of kilowatt-hours which must be paid for at the primary rate before the consumer may enjoy the secondary rate, and have the same entirely consistent with the demand or Hopkinson schedule. We have concluded from our experience that no other differential schedule would have been as simple to apply, as easy for the customer to understand, and leave so few opportunities for errors. We adopted the room basis of determining the primary charge in preference to the one using floor areas for the reason that the measurement of floor areas involved a good deal of expense, resulted in decimals and introduced a much greater probable error.

In the application of any formula or rate devised by the human mind, difficulties are bound to arise and must be solved from time to time. In the Milwaukee Company's schedule of rates for residence lighting all rooms are counted as active except three bedrooms, bathrooms, basement, garret, closets and back porch. In one apartment a room may be used for a bedroom and as such becomes inactive, and in another apartment may be used as a den and thus becomes active. This makes a difference in the amount of energy which must be paid for at the primary rate, and opens up opportunities for discussion between the occupants of the two apartments. The matter is, however, not difficult of explanation and gives little cause for permanent complaint.

If it were practicable for one to take into account the differences in intensities of illumination for different classes of rooms, make an accurate analysis of the cost of serving residence electric consumers, data for which have not as yet been collected, and accurately predetermine the results from any given rate schedule, I would favor the assessment of demand on the floor area basis, as distinguished from the room basis. Until, however, the matter of residence electric service has been more highly developed, and the cost thereof is more accurately known, I prefer the assessment of demands for the determination of amount of energy to be paid for at the primary rate, on the basis of the number of active rooms, rather than on the basis of floor space.

Mr. C. A. Graves, Brooklyn, N. Y.: The Brooklyn Edison Company is about to put its lighting rates on a demand system, in which the maximum demand is to be computed as 50 per cent of the total installation in residences, and 70 per cent for all other premises, each standard socket being rated at 50 watts. The customer, however, has the option of a demand indicator upon the payment of an additional maintenance charge.

As a large part of our business requires underground service, which necessitates higher cost per customer, the smallest demand figured will be 1½ kilowatts. This means that no customer whose bill is less than approximately $10 per month, will earn lower than the primary rate of 11 cents, and conversely, all customers with a demand of 1½ kilowatts, or lower, whose consumption exceeds 90 kilowatt-hours per month, will obtain a lower rate for the excess.

Mr. Lloyd: I have very little to say, except that the discussion puts me in mind of our regular Committee meetings and also a meeting I attended some years ago in Cincinnati where Mr. Henry L. Doherty and Mr. L. A. Ferguson held a heated discussion on the floor along the same lines we are talking on this morning. Only one or two things have I made note of here. As far as the ascertainment of demand in small premises is concerned, I have no doubt that the question will work itself out in practise. What we need is a little more experience.

As to the definitions referred to by Mr. Williams and the riders, I might add that in the latter part of the report the riders are merely suggestive, and are not recommendations for adoption without careful consideration by local companies.

Referring to Mr. Ballard's remarks as to off-peak business, the Rate Committee after a great deal of discussion was of the opinion that off-peak is not a very desirable term. At several of the sessions in the last two days it has been brought out that the maximum demand of a system in different parts of the country occurs at very different times, and, therefore, when we use the term "off-peak," we have to define it. For instance, a speaker last evening pointed out that his peak time came between 10 a. m. and 2 p. m. in the summer-time. Off-peak is generally referred to in eastern and middle-west communities as coming between 4 and 8 p. m. in the winter-time; so you see, when you speak of off-peak rates, you need to give the hours. We have not as yet found what I consider a satisfactory name for off-peak business so-called. The Committee referred to it on page nine as a "feature rate." Therefore, if Mr. Ballard will look on page 190 he will find that we have taken care of his objection regarding perhaps not special but class rates for that kind of business.

I will not take up more time, except to say that the Committee is very desirous of getting into communication with all of the companies in the Association, and we hope that one man in each company may be appointed as an associate of the Committee. In that way we shall get into closer touch with the companies, the manager will know what his representative is doing, and if we find a company asking for assistance, we can attend to it much more advantageously.

MR. WILLIAMS: Mr. Chairman, in view of the splendid work of the Rate Research Committee during the past year, I would like to move you, sir, that the committee be continued, that it be requested to hold further meetings during the year to come, and to make a further report on the subject at the 1913 Convention.

The motion was seconded and carried.

THE CHAIRMAN: Our next paper is one prepared by Mr. Charles A. Munroe, Vice-President of the Public Service Company of Northern Illinois, who is not here. The paper will be put into the record without being read.

THE DESIRABILITY AS A CENTRAL-STATION LOAD OF PUMPING FOR MUNICIPALLY OWNED WATER-WORKS

A large and profitable source of income is available to the central stations from the pumping of water at municipally owned water-works. The number of kilowatt-hours which would yearly be employed in pumping if these water-works were operated by central-station power is very large.

A population of more than 40,000,000 is furnished from municipally owned water-works. A conservative estimate of the amount of water used per day per capita is 40 gallons. A fair average of the energy required to handle 1000 gallons of water is one and one-half kilowatt-hours. An average price for the current would be two cents per kilowatt-hour. The central stations of the country will, if they secure this business, sell per year 744,000,000 kilowatt-hours, yielding gross earnings of $14,880,000.

The desire of every central station is not only to sell a large number of kilowatt-hours, but to sell as large a number as possible off the station peak. The pumping of city water is peculiarly adapted to fit in with the capacity of a central station. By the installation of an elevated reservoir, which if not already in, should be in, it is possible to make the pumping of water by electrical energy practically automatic. The small space required by the electrically driven pumps enables us to install our units without enlarging the existing plant, so that the present plant of a municipality can stand by as a reserve. In addition to the automatic features of operation, the load required for municipal pumping can be dropped on the station peak, without inconvenience to the municipality.

Where the water is pumped from deep wells, it should first be pumped into a surface reservoir and then into a stand-pipe. This decreases the head against which the deep-well pump has to operate, and in case of fire gives a large supply of water on the surface which can be thrown direct into the mains with a centrifugal pump installed for the purpose. This large pump can be operated economically at the distributing voltage without the expense of, and losses from, transformers.

In small towns the stand-pipe will take care of any ordinary fire and the expense of a surface reservoir can be avoided. In every instance, however, where the water is more than 60 feet below the surface of the ground, there should be a reservoir in order to avoid the strain on the deep-well pumps.

Contracts should not be made at a flat rate per thousand gallons of water pumped, unless the source of supply is a lake or river. If the municipal water supply is derived from deep wells and the contract is based upon a fixed price per thousand gallons of water pumped, serious complications may arise.

First: Pumping the water for a fixed price per thousand gallons presupposes that the central station will do the pumping. This involves making repairs, which on deep-well pumps are apt to be very costly.

Second: The central station becomes responsible for the successful operation of the pumps and apparatus in case of fire.

Third: If the wells give out, which is almost always the case, there is the added embarrassment of trying to get the municipality to sink a new well, or, if the level lowers materially, the hardship of pumping the water against the greater head falls on the central station.

It is easier to close a contract on the basis of a flat rate per thousand gallons of water pumped than on a kilowatt-hour basis, because the city officials do not understand the value of a kilowatt-hour, whereas a proposition to pump water at, for example, five cents per one thousand gallons is understood and considered cheap, water being sold usually at from ten to fifteen cents per one thousand gallons. It is, nevertheless, worth the added effort to secure the contract on a per kilowatt-hour basis. On this basis you have known conditions on which to figure. A very low price per kilowatt-hour is justified because of the off-peak character of the load.

In municipal pumping plants, because of the comparatively small amount of power used, the attendance charge is high per kilowatt-hour. In some instances this charge is equal to the total charge per kilowatt-hour by the central station. Two and one-half cents per kilowatt-hour for this business in towns under 10,000 people will result in a marked saving to the city.

Although it may appear that our endeavors to save the city money are not always appreciated, yet in time we are bound to receive due credit for any fair treatment accorded a community.

DESIRABLE FROM A POLICY POINT OF VIEW

More important to the central station than the getting or losing of any one particular piece of business, is the occupancy of the territory without municipal competition. Where a municipality has a water-works station and men on duty all the time, it is natural for someone who knows only half of the story to suggest that by purchasing a generator to be belted to the prime mover in the water-works station, and a few poles, cross-arms, wire, etc., the city can furnish its own street lights at a great saving. The suggestion we all know is a fallacy, but this is sometimes difficult to prove, especially if it gets to be a political issue. If a city can be persuaded to equip itself for furnishing its own street lights, it will not be difficult to get it to go one step further, namely, to distribute energy to private consumers.

The large distributing company is no more free from this danger than is the isolated central station, although the reasons for seeking this result in the case of the one differ from those in the case of the other. To illustrate—the isolated central station is usually locally owned, petty jealousies arise, the collection of monthly bills over a period of years from nearly every property owner in the town, and the friction which results from defects in the service, from overcharges or from complaints badly handled by an overworked manager, create a slumbering feeling of resentment towards the central station.

When the street lighting contract expires and more or less discussion is held in the town over the proposed new contract, some over-zealous alderman secures data from cities where street lights similar to those proposed are furnished at much lower rates and the storm breaks. The central station is put on the "Unfair List" and unless the situation is diplomatically handled loses the street lighting contract and perhaps has municipal competition for its private business.

The central station operating in several towns is subject to this danger from another source. The isolated central station goes out for very little power business. It is embarrassed by getting too much of this business because some of the other plants have generating stations as large as that of the central station.

When a distributing company is once established it makes a drive for every bit of business, large or small, in the community, with the result that much of this business is obtained. Engineers and firemen whose services are no longer needed are out of a job. The engineers at the water-works see the handwriting on the wall, and have perhaps forestalled an effort to dislodge them by pointing out the ease with which the street lights could be supplied from the pumping station.

To conclude: Here is a class of business which from an economic point belongs to the central station, because the central station can pump the water at a price which will save money to the municipality and make money for itself.

If this business is gone after in an aggressive way before it becomes a political issue, it should be secured without difficulty.

With the city pumping plant shut down and operated from central-station company's service, a source of possible trouble is eliminated, and the saving made for the city creates friends for the central station.

THE CHAIRMAN: We will now resolve this meeting into the Executive Session.

EXECUTIVE SESSION

Wednesday Morning, June 12

The Chairman, President Gilchrist: The first number on the program is the presentation to the Executive Session for approval of the Public Policy Committee Report, Mr. Arthur Williams, New York City, Chairman.

Mr. Williams: The Public Policy Committee Report has been printed and is issued and circulated amongst the Class A membership. The Committee has unanimously requested Mr. Samuel Insull to present the report at the special meeting of this evening, and Mr. Insull has very kindly consented to do so. The report in full will therefore be presented at that time by Mr. Insull, and the only action, I think, to be taken at this Executive Session is its adoption or rejection.

It was thereupon moved, seconded and voted that the report of the Public Policy Committee as presented be approved and adopted.

The Chairman: The next number on the program is the presentation of the proposed constitutional amendments by Mr. Frank W. Frueauff, Denver, Colo., Chairman.

REPORT ON CONSTITUTION AND BY-LAWS

The committee appointed for this purpose has carefully prepared various constitutional amendments and changes in the constitution, and these have already been printed in the company *Bulletin*. The constitution of the Association provides that a committee be elected by the Association to consider such changes, and I would suggest that the Report on Constitutional Amendments be referred to a committee now to be elected and that this committee make suitable recommendations at a later session of the Executive body. I will simply introduce the amendments which have been recommended by the Committee.

It was thereupon moved that the committee be appointed by the chair, and the motion being duly seconded was put to vote and carried.

THE CHAIRMAN: I would suggest that some nominations be made.

MR. J. B. MCCALL, Philadelphia: I suggest, Mr. Chairman, that the committee which prepared this report be put in nomination and elected as the committee, with instructions to present its recommendations at a future session.

THE CHAIRMAN: It is the suggestion of Mr. McCall that the committee that prepared this be put in nomination and elected. Is there a motion?

It is regularly moved and seconded and upon the motion being put to vote was carried.

THE CHAIRMAN: The next number on the program is the report of the Treasurer, Gen. George H. Harries, Louisville, Kentucky.

The report, as follows, was read by the Secretary.

FINANCIAL STATEMENT

JANUARY 1, 1911, TO JANUARY 1, 1912

Cash in Old Colony Trust Company	$5,000.00		
Cash in National State Bank, Jan. 1	3,136.46		
Cash in Lincoln National Bank	6.68		
In petty cash	300.00		$8.443.14
Class A dues, 1910	$40.00		
Class A dues, 1911	16,146.25		
Class A dues, 1912	127.50		
Class B dues, 1909	122.00		
Class B dues, 1910	2,346.00		
Class B dues, 1911	32,519.10		
Class B dues, 1912	79.00		
Class B dues, 1913	2.00		
Class C dues, 1910	5.00		
Class C dues, 1911	130.00		
Class C dues, 1912	5.00		
Class D dues, 1908	20.00		
Class D dues, 1909	40.00		
Class D dues, 1910	79.60		
Class D dues, 1911	4,260.00		
Class D dues, 1912	20.00		
Class E dues, 1909	10.00		
Class E dues, 1910	150.00		
Class E dues, 1911	3,433.60		
Class E dues, 1912	19.00		
Entrance fee Class D members	50.00		
Commercial Section dues and publications	1,763.55		
Power Transmission Section dues	37.50		
New England Section dues	2.50		
Advertising Thirty-third Convention	560.80		
Advertising Thirty-Fourth Convention	3,014.20		
Electrical Solicitor's Handbook	294.70		
Question Box Revision	15.00		
Sale of publications	1,562.59		
Refund magazine subscription	2.00		
Convention daily refund	80.94		
Interest on bonds	375.00		
Refund Bulletin postage	100.00		
Refund for rent	15.00		
Refund for telegrams	1.57	$67,429.40	
Class A percentage dues	$15,985.82		
Registration	2,571.00		
Entertainment	50.00		
Convention Daily, 1911	1.75		
Convention, rent and sale of counter	92.50		
Convention travelling expenses	8.00		
Stenographic report	200.00	18,909.07	$86,338.47
Total			$94,781.61
Less disbursements			86,130.83
Balance			$8,650.78
Old Colony Trust Co.			5,000.00
National State Bank			3,350.78
Petty cash			300.00
			$8,650.78

This balance is exclusive of $15,130.42 invested in bonds as follows:

Commonwealth Edison 5's	$5,146.53
Minneapolis 5's	4,983.89

DISBURSEMENTS

Salaries	$17,740.91	
Office rent	4,276.95	
Telephone expense	205.45	
Bulletin expense	7,122.53	
General office expense	646.18	
Miscellaneous expense	314.39	
Postage	1,221.40	
Printing and stationery	992.22	
Printing 1910 Proceedings	13,410.25	
Printing 1911 Proceedings	91.87	
Expressage 1910 Proceedings	1,268.17	
Expressage 1911 Proceedings	55.94	
Printing and expense publications	451.88	
Expense Overhead Line Construction Com.	375.98	
Expense Pole Preservative Committee	443.35	
Expense Executive Committee	167.06	
Expense Lightning Protection Committee	22.42	
Expense Public Policy Committee	9.93	
Expense Membership Committee	51.50	
Refund Class B membership dues	63.00	
Refund Class A membership dues	5.00	
Refund Class E membership dues	13.00	
Class E dues check returned unpaid	5.00	
Commercial dues checks returned unpaid	5.00	
Expressage	304.14	
Office furniture and fixtures	562.96	
Solicitor's Handbook	2,413.05	
Question Box Revision	252.75	
Cut for advertisement	2.88	
Expense Commercial Section	929.17	
Expense New England Section	2,658.55	
Expense Power Transmission Section	385.40	
Expense Eastern New York Section	289.05	
Expense Nebraska Section	200.00	
Expense Georgia Section	269.75	
Expense Pennsylvania Section	2,500.00	
Refund to publications	1.00	
Miscellaneous expense Seattle Convention.	14.91	
Transportation expense Seattle Convention	318.95	
1911 Convention entertainment	12,445.50	
Convention rent, music, etc.	2,446.67	
Registration circulars, badges, etc.	1,145.26	
Convention expense, hotel, travelling	328.18	
Convention publicity	450.10	
Transportation expense, circulars, etc.	434.25	
Convention salaries	281.30	
Stenographic report	675.40	
Convention telephone calls	166.85	
Convention miscellaneous	95.70	
Convention papers, cuts, printing, etc.	7,083.93	
Hotel committee expense	515.75	$86,130.38

RECAPITULATION GENERAL FUND

Old Colony Trust Company	$5,000.00	
General Fund Jan. 1, 1911	3,443.14	
Receipts during January	86,338.47	$94,781.61
Disbursements as per detail list	$86,130.83	
General Fund Jan. 1, 1912	8,650.78	$94,781.61

DISPOSITION GENERAL FUND

Cash in National State Bank	$3,350.78		
Cash in office	300.00		
Cash in Old Colony Trust Co.	5,000.00	$8,650.78	
Investments at cost:			
5,000 Minn. General Electric 5 per cent bonds due Dec. 1st, 1934	$4,983.89		
5,000 Commonwealth Edison 5 per cent bonds due June 1st, 1934	5,146.53	10,130.42	$18,781.20

ASSETS

Cash and investments	$18,781.20	
Office furniture	3,611.73	$22,392.93

LIABILITIES

None except current bills.

THE SECRETARY: Gen. Harries unfortunately cannot be with us, but I have his report in my hand, accompanied by a letter from the Auditor, which, I think, summarizes the figures sufficiently for our purpose without going into the detail figures; and that letter is accessible to any member company. The report of the Auditor is as follows:

To the Officers and Executive Committee of the National Electric Light Association:

GENTLEMEN—I beg to advise that I have examined the accounts of the Treasurer of your Association for the fiscal year ending January 1, 1912, and certify to the correctness of the Treasurer's report as submitted.

I also examined the accounts to and including May 1, 1912, and found all receipts and disbursements properly accounted for and available cash in office and in bank as of that date to the amount of $32,227.01.

The books of the Association also show an investment account of $10,130.42, representing $5,000 par value Commonwealth Edison Company 5 per cent General Mortgage Bonds, $5,146.53, and $5,000 par value Minneapolis Electric Company 5 per cent Bonds, $4,983.89.

Respectfully submitted,
S. A. Sewall,
Ass't to Secretary.

It was regularly moved, seconded and voted that the report be accepted.

The Chairman: Our constitution provides that on the second day of the convention, a Nominating Committee shall be selected to place in nomination the officers of the Association for the ensuing year. The next number on our program is the election of this nominating committee; and suggestions of names are now in order.

On motion, duly seconded and carried, the following committee was elected:

COMMITTEE ON NOMINATIONS

Mr. Samuel Insull, of Chicago
Mr. H. L. Doherty, of New York
Mr. H. T. Edgar, of Seattle
Mr. J. E. Montague, of Buffalo and Niagara Falls, N. Y.
Mr. Mike Hart, of New Orleans.

The Chairman thereupon appointed the following Committee on Resolutions: Mr. Arthur Williams and Mr. T. C. Martin, of New York.

Mr. F. W. Hild, Portland, Oregon: In behalf of the City of Portland, Mr. Chairman, I would like the privilege of extending a most hearty and cordial invitation to all the members of this Association to come to Portland. We are ready down there to meet and entertain you, and I wish to say to you also that Portland is one of the four large cities of the Coast. [Applause.]

Mr. Arthur Williams, New York City: Might I suggest, Mr. Chairman, that this invitation be offered to a larger meeting this afternoon and also to the other Sections, because I feel that a large number of the membership would be glad to go to Portland. I am quite sure that Mr. Hild did not pick so small a meeting intentionally for anything as kind as his invitation.

Mr. T. C. Martin: I suggest that Mr. Hild visit the other Sections so that they may see him.

MR. HILD: I will do so.

MR. MARTIN: I will escort you.

MR. MIKE HART, New Orleans, La.: We of New Orleans wish to entertain this convention at its annual meeting in 1913, and I desire to deliver the invitation here and now.

MR. M. C. OSBORNE, Spokane, Wash.: On behalf of the Washington Water Power Company, I want all of the delegates to know that Spokane is on the map in the eastern part of the State of Washington. [Laughter and applause.] Any of the returning members who can come over and stop there will, I believe, be repaid for the visit. We have some things over there that you cannot see in any other portion of the country.

MR. SAMUEL INSULL, Chicago: If it be in order, Mr. Chairman, I will move that the invitations of the two gentlemen be referred to a committee.

It was regularly seconded and voted that the motion be adopted.

It was moved, seconded and voted that the following Resolution be sent to the Canadian Electrical Association in session at Ottawa.

WHEREAS, Our affiliated sister society, the Canadian Electrical Association holds its annual convention at Ottawa during the coming week, it is hereby

RESOLVED, That the Secretary telegraph to President Dion a message of greeting and of best wishes for a successful and useful meeting.

(Adjourned.)

PUBLIC POLICY SESSION

WEDNESDAY EVENING, JUNE 12

THE CHAIRMAN, PRESIDENT GILCHRIST: Mr. F. W. Hild, of Portland, Oregon, has an invitation to extend to the meeting.

MR. HILD: Mr. President and Ladies and Gentlemen—Most of you yesterday heard the eloquent and cordial invitation extended to this Association by Mr. John Britton, of San Francisco, to hold its convention in 1915 in the wonderful city of the Golden Gate. We of Oregon second and endorse that communication most heartily.

I come here to-night to repeat the invitation which was briefly mentioned at the Executive Session this noon. The City of Portland invites you one and all, and all of your friends, to visit her at the conclusion of these exercises. The name of Portland has undoubtedly reached many of you, but for the benefit of those who do not know it, let me, as a comparative newcomer in the West, say that all those who have been there pronounce it one of the most beautiful and charming cities in the country. To you of the East it will appeal as a city of education, of refinement, of conservatism and of wealth; to you of the West it will appeal as a city of push and hustle, and to all of you its marvelous progress must be known. Portland is now in holiday attire. She is celebrating her sixth annual rose festival. She is distributing millions of roses along the coast and has the unique and pleasant privilege of sending thousands of roses here to this convention. [Applause.]

We of the electrical interests in the State of Oregon have arranged a little program which we hope you will take advantage of and come to see us at the conclusion of the exercises here. The city is now entertaining some fifty thousand visitors and yet can take care of many thousands more. Our hotels are ample. We have selected the largest and newest hotel in the West as headquarters for the National Electric Light Association, but we would strongly urge you who have not already sent in your reservations to visit the special representative of the hotels. Already some hundred or more have taken advantage of this opportunity. The railroads have made special arrangements to take care of you on the way there. As to the entertainment which Portland plans, we have arranged trips in the morning, in the evening and every afternoon, to see the city; other trips up the beautiful Willamette River, and for those of an engineering turn of mind, a trip to the most recent power plant completed in the West, a large plant of the newest type of construction. In speaking of Portland and inviting you to our city we do not come with brass bands. We seek in a dignified way commensurate with the importance of this Association to make you feel that Portland welcomes you. I can do no more than use again the words Mr. Britton spoke yesterday. He says that Portland reminds him of a beautiful young lady, with roses in her cheeks, her eyes sparkling and her lips smiling; she is gowned as though for a party. She invites you all to call upon her. [Applause.]

THE CHAIRMAN: The secretary has two more notices to give out.

MR. MARTIN: Early in the day we had an invitation from the Yakima Commercial Club to visit North Yakima and the Yakima Valley. At the request of Mr. J. E. Davidson, President of the Northwestern Section, I repeat that invitation, because the valley is one of the best illustrations in the world of irrigation and pumping applied with the aid of electricity to diversified farming and fruit culture. It is hoped that a great many of our members who are interested in the extension of circuits and service to the rural districts will take advantage of this opportunity and see for themselves what has been done and what can be done in the annexation of this new field. We also have the invitation of the Puget Sound Traction, Light and Power Company to take a trip to Snoqualmie Falls and the White River Power Development. There are already a great many indications that our members will take advantage of the splendid opportunity to see two of the best power developments in the great Northwest. Mr. Morton Ramsdell, who has the matter especially in hand, has requested me to say that the special train carrying the guests of the Puget Sound Company to these two plants will leave the Northern Pacific Station at 8:15 a. m. on Friday, and that it will be impossible to delay its departure. Therefore, the guests should be at the station before that time. In view of the hospitality which is being shown us, this seems an almost impossible proposition, but Mr. Ramsdell insists that we have got to rise to it. [Applause.]

The Chairman: Wednesday Evening of Convention Week has become historic in National Electric Light Association matters as the night on which the Public Policy Committee presents its report. The committee has held almost monthly meetings. Members have come half way across the continent in some cases to attend several of them, such was the interest of the members in the work of the Committee, work unselfishly designed for the benefit of our industry.

It has been the rule of the Committee that after the results of the various meetings of the year have been shaped up, the final report shall be presented by the ablest member of the Association that we are able to find, and it devolved upon me to secure a representative this year. I am happy to say that I was successful in securing for you a member of the Association, and a most active member of the Committee, a gentleman whom you all know and have good reason to know in the best possible way, and one who needs no introduction to you, Mr. Samuel Insull, President of the Commonwealth Edison Company of Chicago. [Applause.]

Mr. Insull then read the report as follows, prefaced by the accompanying address:

Mr. Insull: Whilst most of our members are fully familiar with the work of the Public Policy Committee I have read the names and explained the business connections of the members so that those who are present here as visitors shall understand the important positions which most of them occupy in this great industry. The committee in question, in my judgment, represents not less, in one way or another, than one-half of the money invested in the electric light and power business of the United States, so that in speaking on the various subjects dealt with in the report, they are speaking with the responsibility of men who have the care of upwards of a thousand millions of dollars of investment. I want, too, to point out to our visiting friends of Seattle, that the greater part of that report is given to the consideration of the welfare of employees, and questions of the duties we owe to the various communities in which we are engaged in business. I do not want you to infer that we in any way look at the welfare of our employees from a charitable viewpoint. We think it is part of good business to do whatever we can to improve the position of those engaged in ordinary employments in our business. We think that in any business, whether it is a public service business or whether it is a private enterprise, it is a proper part of the cost of production or of "Readiness to serve," as we call it in public service business, to render the necessary protection to the employees of that business, whether that protection is needed because of accidents possible in the pursuit of their duties, or whether it is needed in the shape of late life provision in one form or another for the employee who has devoted his whole life to the service of our various companies and indirectly to the service of the communities which we supply. [Applause.]

Our report has referred somewhat to industrial unrest, a wave of which seems to have gone around the globe; a wave which is fortunately noticeable to a lesser extent in this country than anywhere else, as we are too prosperous to feel the extreme effects of it. The cure for industrial trouble to my mind and to the minds of our committee is to have contented employees and the recommendations of the committee both in the report which I have just read to you and in the report of last year turn on the necessity of having contentment amongst those who are working for us.

Savings funds encourage thrift and lead to the acquisition of property, and there is nothing that will bring to a man or a woman's mind the sense of responsibility as soon as the acquisition of property. If you can encourage in employees habits of thrift that will lead them of their own volition, in addition to what the companies for whom they work may do, to provide for a rainy day, you are raising and creating in their minds a sense of responsibility; you are raising the standard of your employees thus placing yourself in a better position to serve the communities in which you work.

Some reference has been made in the report to municipal ownership, that is, to the municipal ownership of utilities such as those in which we are engaged. It is a subject that has been discussed for years. It has been threshed out east of the mountains and the agitation in its favor has been made largely on economic grounds. We are meeting this year in a city that is in the unique position of having not only a municipally owned plant serving the city in its public lighting and serving its citizens with commercial light and power, but also, side by side with it, a large and profitable privately owned corporation in the same line of business. I am not here to enter into any controversy with our good friends and hosts, but economically, the course which they are pursuing is wrong. The generation and distribution of electric energy in any community, I care not whether on the Pacific slope or on the Atlantic seaboard, can be most economically operated by concentration of the production and distribution of that energy for all kinds of purposes, whether public or private, whether for the stationary motor or for urban or interurban transportation, or possibly, as years roll by, for the electrification of the great steam railroads of the country. That service, I say, can be rendered on the most economical basis only by absolute concentration of production and distribution. Speaking of it entirely from an economical position and pushing to one side the political situation, the only way to get the best results out of the money invested is by concentration and by monopoly. I do not know what could be saved in this community by such concentration, but I do know that, figuring over a period of ten years for New York and the surrounding territory, a proper concentration would save there not less than $150,000,000; and in Chicago, in which it is my pleasure to live, I know that over the same period a concentration would save $75,000,000. Those figures are the figures of the economics of the situation, the finance of the situation, and I am foolish enough to believe that what is economically right should be and eventually must be practised. [Applause.]

We are living in an era when it is rather the fashion to abuse the corporations. I do not know myself exactly what is the cause of it. I do not know whether our methods are wrong. We try so far as we can to conduct our business in a fair and honest way, but the profits of any public service company are relatively small, ridiculously small, compared with the returns any man expects on his private capital in any private business. But, such is the situation. Some of our friends here have said from this platform that they think it is merely a symptom; a symptom that the public feels something is wrong. I presume that is about as good an explanation of it as can be given. I think myself that it is a feeling created largely by people who have some ax to grind, some self-interest to protect, a desire to lift themselves in the political scale by pulling down somebody else who is engaged in business. But whatever may be the cause, whether or not there be anything wrong with our methods, it rests with us as a matter of duty, as a matter of right and wrong, to set the public right. If the trouble with the situation is that the ordinary man in the street is misinformed, it is our duty to do whatever we can to inform him correctly. One of the encouraging things of the time, to my mind, is the progress made throughout the country, in the establishment by legislative enactment, of commissions to regulate natural monopolies such as ours, public utility commissions.

I think the establishment of such commissions will go far to end the incidental troubles that we have had in various parts of the country from competition in a business which should be run as a monopoly. I think the establishment of these commissions will go far to remove from the public mind the idea that there is anything particularly wrong with our business, because in a greater sense than now, all our actions and all our reports will be a matter of public record. Consequently I think it to the best interest of our membership in the direction of the protection of the monopoly, to do everything we can, as the committee recommends in its report, to encourage the establishment of State Commissions to deal with our affairs, providing that such commissions are established on lines which will allow us a fair profit, which after all is little more than the interest you can get on your money if you place it out on farm mortgages in this western country.

It has been rather our habit at these meetings to review our relations with the various interests more or less connected with us, either in manufacturing or in banking, and at times it has been my duty to direct attention to the action of certain manufacturing companies in their methods of dealing with us and to their raiding of our properties by the encouragement of opposition plants. I am very glad to say that at this time there is less of that kind of thing going on than has gone on at any time since I have been engaged in public service business. We have every reason to be well satisfied with our situation to-day, and I do not know a better way of illustrating the view of our business taken by kindred interests, than to refer to what has happened during the last few months since the death of my friend Mr. Mather. The directors of the Westinghouse companies sought in one of our large corporations operating Public Service Companies in different parts of the country for Mr. Mather's successor and found him in the person of Mr. Guy E. Tripp, who is with us on the occasion of this Convention and present at the meeting this evening. [Applause.]

The question of our relations with bankers is to-day the more important. Unfortunately we are in a business that requires a great deal of money. It is impossible to run a public-service business such as an electric light and power business, without putting into that business original capital to the extent of five or six or seven times the annual gross receipts that we may get from any increase. That is, if we get one hundred thousand dollars' worth of new business, assuming that the plant is fully occupied, it is impossible to take care of that business without investing five or six or seven hundred thousand dollars more according to the local conditions that may exist in different communities. Therefore the most important question we have to deal with outside of our relation with the communities in which we operate, is the question of the integrity of our securities, and that question should not interest us only, but should interest the distributors of those securities as the trustees and representatives of the investors whom they get to take our securities. There has been more or less tendency during the last few years in a number of banking houses to encourage the projection and financing of competing generating and distributing companies simply, I presume, from the point of view of the immediate profit of financing that must accrue from such operations. Fortunately, however, this amounts to a small percentage when compared with the whole development of our business throughout the country. I think one of the most important subjects that the Public Policy Committee of this Association can give attention to is this question. Involved in it is the very life blood of the business, the getting of the capital necessary to extend it and to protect this, and unless we all of us exercise the closest care in guarding the integrity of the securities we offer, we must eventually kill the goose that lays the golden egg. [Applause.]

We have heard pretty fully discussed in this room to-day the question of hydro-electric plants and the relation of the United States Government to their development, or their lack of development, along the Pacific slope. It seems to me that your Public Policy Committee might do well in connection with the Power Transmission Committee, to follow up this subject and give it the same class of attention that they give to such questions as those I have already discussed. It is of importance locally to you people of the Pacific slope, and of great importance to those of us who are engaged in the business in States where we have more or less hydro-electric power either developed or undeveloped, as the tendency, right or wrong, is to follow the policy of the Federal Government. I am not going into a discussion of the question of conservation or lack of conservation by the Federal Government. I am mainly interested in it myself from the point of seeing all sources of power developed for present use in connection with our industry, helping us to get energy at the lowest possible cost of production and distribution, and thus enabling us to sell it to the consumer at the lowest possible price. The only way that this can possibly be done, if the power is to be produced from sites that are owned either by the Government or the States, is by getting from either the United States Congress or the State Legislatures the necessary laws to give fair protection to the capital invested, thus enabling us to raise money cheaply. I believe that your Policy Committee can render you good service in educational work in this direction.

It is not my intention to keep you more than a moment longer, but before I take my seat I want to talk upon a subject of more general interest to me, that is the position and influence, the great influence for good, of the wonderful institution, the National Electric Light Association; and to appeal to our brethren of the Pacific slope to themselves take advantage of it, and to do everything they can to foster it; as only by extending its operations to every company throughout the United States can we carry it on to the success that those of us who have been engaged in the work for so many years hope for. To-day it is the largest technical institution in the world. While primarily it is engaged in work for the protection of its own members, its operations must and will add to the development and success of this wonderful empire west of the Rockies, whether it be under the Stars and Stripes or under the Union Jack, extending from the Arctic Circle to the Latin-American country. What is needed above everything else in this western country is population, for that brings with it electrical development. You people of the Pacific slope have met situations where the necessity of finding a market for your product was paramount, and have sharpened your wits in discovering methods to create that market. We people of the East have had a little longer experience in this kind of business. Excuse my saying so, but there are some problems in connection with the business that I think we understand a little better than you do. While there is a tremendous amount that we can learn from you—and we from the East have felt in the last couple of weeks in going up and down the coast that we have learned a great deal from you—still we think that you can learn something from us. In union there is strength and I appeal to those who have the same enthusiastic interest in this business on this side of the mountains, that we on the other side have, to join hands with us and to do whatever you can by joining our Association, to help us in working out our problems and we in turn will help you to work out yours; and to lead this Association on to success such as we have never dreamed of achieving. [Applause.]

REPORT OF THE PUBLIC POLICY COMMITTEE

A Word Concerning Past Work

Permit us to call to your attention that this is the sixth annual report of your Public Policy Committee. The first report, of quite an informal nature, was made in the spring of 1906, at the 29th Convention, held in Atlantic City, under the Presidency of Mr. W. H. Blood, Jr. It was confined largely, if not entirely, to the suggestion that the members of the Association, having engaged in the public service, enjoying rights of an unusual nature, were under a definite obligation to perform this service according to the highest ideals of public duty.

From that time our reports have covered various matters of public concern, including a comparative study and analysis of the public service commission laws of Massachusetts, New York and Wisconsin; our views, favorably expressed, upon legislative regulation of public utility corporations where properly safeguarded and not infringing upon the field of executive or administrative management; on questions of municipal ownership and operation; on franchises, taking the position that they should be granted under conditions which permit permanent investment yielding a fair return, yet which fully safeguard the interests of the public; on various Supreme Court decisions and their effect upon our industry; on rates and methods of charging; culminating in last year's report, devoted entirely to the consideration of standards of compensation between our company-members and their employees.

In passing it may not be amiss to remind you that last year's report, after its formal adoption at an executive session of the Association, was publicly presented before an enormous audience at the New Theatre in New York City. The evening was one of unusual inclemency, rain falling in torrents, and yet such was the general interest in the subject that this great structure was practically filled. President Freeman presiding, the report was presented by Mr. Samuel Insull, after which an address was delivered by Mr. Secretary Nagel, of the Department of Commerce and Labor, who came from Washington especially for the purpose as the representative of President Taft. For clearness, comprehensive grasp, broad humanity and eloquence, the Secretary's address will always hold high place in the annals of the Association.

Last Year's Report Reaffirmed

After a year of further consideration, your Committee feels that no backward step should be taken in any of the recommendations of that Report. On the contrary, we emphasize that its conclusions and principles should be re-affirmed.

Industrial Unrest

It must be apparent to even the unobservant that a serious state of growing unrest exists throughout the industrial world. Reference to this condition was made in earlier reports, since when it has not diminished. Rather has it grown in intensity, and now spreads over a wider area of industry.

Our own country is perhaps more fortunately situated than others at the moment, yet here exists a present and growing state of unrest and dissatisfaction. The most recent expression of this reaches us through the enormous enhancement of the socialistic vote—a vote meaning, in our judgment, a wide reaching spirit of rebellion against some of our existing social and industrial conditions.

Some Change Seemingly Inevitable

The old order is undergoing change—no less real because the result is reached by changing public opinion rather than by physical effort. We urge upon our member companies careful consideration of their standing in the communities they serve; that the utmost care be exercised to eliminate on their part any conditions leading to friction, criticism, or a sense of injustice. We urge the adoption of methods by which the communities we serve may realize our own appreciation—too seldom publicly expressed—that we have a public service to perform, and our willingness and purpose to perform it in the most enlightened manner. In all our relations, public or private, nothing should be approved which contains the slightest degree of injustice or unfair dealing.

"Natural Monopoly" and Public Regulation

In our judgment, the interests of the public are best served by giving public utilities, such as our own, a monopoly in the fields they occupy—thereby enhancing the capacity and stability of the generating plants and supplying systems, and through economies obtainable with greater production, eventually rendering service at lower prices. We urge the acceptance of the principle in our membership, and by those engaged in the manufacture of apparatus and equipment, that the establishment of competition operates against, not for, the public good; it tends to destroy existing values and to create new obligations of uncertain stability. With extending and wise legislative control of our utilities, your Committee believes that the continued acceptance of the principle of a regulated natural monopoly is beneficial and not harmful to the public and to our own interests.

Monopoly Enhances, Not Lessens, Public Accountability

Where monopoly of service is granted, a higher degree of responsibility rests upon us to become an important factor in that which makes for the larger and better development of the community in which the service is rendered. If possible, effort toward good service fair prices and courteous treatment should be greater than where competition is most keen. This is demanded by good faith and no less by good management.

Alleged "Conservation" in New York

A movement has been under way for the State development of the water powers of New York, and the distribution of current to the many municipalities, along the lines adopted by the Hydro-Electric Commission of Ontario. Our local member companies are endeavoring to meet the question on constructive lines, without in any way opposing the proper development of any natural resources. They hold, however, that their development should be accomplished without the destruction or retardation of private enterprise, or in a manner burdensome to the people as a whole.

Your Committee is opposed to any department of American Government—Federal, State or Municipal—engaging in private business. If the State can be legitimately employed in any such enterprise, it may better devote its energies to the development of public lands for farming purposes, as in the State of New York, which owns very large areas, thus conserving the interests of every one, rather than of a relative few. But we hold, emphatically, that the functions of Government should be as simple and limited as possible, that the civil list should be confined to the smallest number of employees, and that the field of fairly conducted private business must not be invaded.

Parsons, Kansas, Situation

The question of the authorization of a competing electric lighting plant has recently been raised before the Public Utilities Commission of the State of Kansas in the case of the company in Parsons of that State. The importance of the case as a precedent was very great, as the attitude taken by the Commission in its first case would be likely to fix the policy to be pursued in the future. At the urgent request of a member of the Association, a comprehensive brief was prepared by our General Counsel, a member of this Committee, and was submitted to the Commission. The result was most gratifying, the Commission taking the broad ground that, in the absence of controlling reasons to the contrary, competition in the supply of a public utility is not to be encouraged or approved, because of the economic waste involved and the poor service following as a consequence. Such an attitude, on such a broad question of public policy, taken by such a Commission, is likely to have far-reaching results, particularly in the western sections of the country. A copy of the decision is included in the Appendix.

Publication Bureau

Criticism has been made that our industry has been without the means of providing accurate and recent information upon which a defense against the advocates of municipal ownership might be effectively maintained. In the opinion of your Committee, this criticism has been justified. Any successful campaign against municipal ownership must be conducted on economic lines, based upon unquestioned facts and conditions. Oratory, mere expression of opinions or theories will avail little, if at all. The movement can be checked and eventually eliminated only by education; by placing our facts before the public and allowing it to form its own conclusions; but behind all this our companies must render good service at fair rates.

Library and Publication on Municipal Ownership

Your Committee is pleased to report the organization during the year of The Municipal Ownership Publishing Company, at 17 East 38th Street, New York City. This Company will maintain a library, from which the general public, including, of course, our member companies, may quickly obtain the latest available information, from all parts of this country and Europe, on the subject of Municipal Ownership. In addition, it will issue a monthly publication in reference to the movement and its economic features. The work of the Publication Company is to be confined largely to providing carefully confirmed facts to the editorial and magazine writers of the country, to public officials, to our educational agencies and to others who may be interested in the subject.

With the uncolored facts fairly presented, your Committee believes that conclusions upon this question may be safely left with the public. In the recent past but one side of the case has been presented. The public, like a jury, can judge only from the evidence laid before it, and this can be done most effectively through the public press. Instances may, and doubtless do, exist where newspapers try to mislead the public, but this, we believe, is the exception, rather than the rule. Every writer must know that the public cannot be long deceived. Deceit and misrepresentation may pass unchallenged for a while, but in the end will be uncovered, with destructive reaction.

Responsibility Rests Upon Ourselves

On the other hand, we cannot expect our newspaper and magazine writers at present to be expert accountants or industrial analysts, or to discard their daily routine to make a local engineering or economic investigation. It is because the publicity organization in question is planning to cover the entire field with accuracy, for this purpose obtaining the economic facts without bias or prejudice, and intends to follow a course that will win the confidence of writers, and through them of the public, that your Committee feels justified in commending this organization for your consideration and support.

"Welfare" Work

It is gratifying to report that, among other movements, during the year "Service Annuities" have been adopted by the Commonwealth Edison Company, Chicago, the Employees' Savings Fund of which Company now amounts to $230,000 and owns 2,300 shares of the Company's stock. An interesting feature of the "Welfare" work of that Company is the continuation on the payroll, for periods ranging from one-half a month to six months, of fourteen tubercular employees, whose wages or salaries during the period of illness amounted to $2,740.

The Edison Electric Illuminating Company of Brooklyn has continued its plan of Profit Sharing, and at the end of 1911 devoted to this purpose $45,674.50, compared with $38,171.03 at the end of 1910; the employees' savings, in addition to their Profit Sharing credits, amounted on April 15, 1912, to $91,641.15; the combined total in the Investment Fund on April 15, 1912, was $176,783.66, and the employees through this fund owned 962 shares of stock and $34,000 of the Company's debentures.

A most important step in general "Welfare" work has been taken during the year by the Edison Electric Illuminating Company of Boston. The organization of that Company has been divided into five Bureaus—Accounting, Construction, Executive, Operating and Purchasing. A sixth Bureau has now been created, which will probably be called the "Welfare Bureau," for which a chief has been appointed. This Bureau will have entire charge of the general relations of the Company with its employees in all matters outside of their regular duties and employment. Naturally, the plans are still in a tentative or formulative state, but the intent is an organized effort to make practical application of last year's recommendations of your Committee.

The Philadelphia Electric Company's Beneficial Association continues to automatically take care of all cases of temporary disability, whether by illness or accident. During the past five years $61,000 have been paid on account of temporary disability; $42,000 paid in death benefits to the beneficiaries of forty-eight deceased employees, while for the full period of five years the total contributions of the deceased members to the Death Benefit Fund amounted to only $325, or an average of less than $7.00 per member. There is a surplus in the Treasury of $33,000.

The Service Annuity plan adopted is one of the most liberal ever offered to the employees of any institution. On account of the retiring age not being compulsory there is but one member on its rolls. His annuity is equal to about 50 per cent of what he had been earning. Generous encouragement is also given to welfare work of educational and physical character, the Athletic Association having a membership of nearly 900. The annual distribution of cash to employees every Christmas, a custom of years, is being continued in addition to all other welfare work.

The Cleveland Electric Illuminating Company has for eight years distributed through its Employees' Fund a sum increasing annually from $6,457.72, or 6 per cent of the annual earnings of 145 members in 1904, to $34,195.58, or 8 per cent of the annual earnings of 463 members in 1911. The total distribution made to 1912 is $136,881.55, of which amount $57,817.40 has been distributed in cash and $79,064.15 remains in the Fund to the credit of employees, whose accounts are credited with 4 per cent interest annually. The Company also assumes all medical expense following accidents to employees while engaged in their work, and usually allows full compensation to such disabled employees.

Stone and Webster have adopted throughout the various branches of their organization a plan for welfare work which, while not as yet crystallized into a well-defined system, is, nevertheless, extremely effective and has given, so far as can be learned, entire satisfaction. Recognizing first the desire on the part of the employees of the various branches of the service to participate to some extent in the profit of the organization, the firm organized, several years ago, the Stone and Webster Employees Investment Association. This is an Association with a Board of Trustees acting under a deed of trust. The trustees are made up of a number of employees and also the members of the firm. From the Board of Trustees is elected an Executive Committee, whose duty it is to attend to the affairs of the Association and make the necessary investments. The firm furnishes, without expense, the necessary headquarters and most of the clerical force needed for carrying on the work, and, in addition, gives the Association an opportunity to invest in any undertakings upon the same basis as the bankers or original syndicates which invest in the enterprises. Besides this, the firm, at the start, contributed a substantial amount of money to form a guarantee fund to provide against possible loss. The employees of the organization have availed themselves very largely of this opportunity to invest, and the Association has paid over a period of ten years an average of about 7 per cent, and there are at present deposited in the Association between $600,000 and $700,000. The various branches of the Stone and Webster organization also have special funds deposited in trust for welfare work. The Stone and Webster Engineering Corporation has adopted the policy of setting aside a certain amount each year, which may be used at the discretion of the officers for the benefit of employees. So far, it has been used mainly in providing help in case of illness and pensions for men who, through illness or for other reasons, are incapacitated for work. As yet no old-age pensions have been established, as there has been no demand for it, but in the course of time this will undoubtedly be necessary. In the various camps where engineering work is carried on, the Company has provided special lodgings for its men and organized clubs among the men, to which the men themselves contribute in part, and the Company in part, in order to provide comfortable living quarters and hospital accommodations in case of illness. In the operating department of the business, similar clubs have been organized in the cities where Stone and Webster have street railway, lighting or power plants, and colony houses have been established partly by the employees and partly under the patronage of the organization.

H. M. Byllesby and Company now have an Investment Club, through which the employees of their various interests may invest their savings. Membership is entirely voluntary. Starting in 1910, there were 350 members, with subscriptions amounting to $57,064, upon which in eight months a substantial profit was realized; in 1911 the investments amounted to $225,710, divided amongst 857 subscribers; a further series of investments was started in August, 1911, for which there were 864 members subscribing $301,952.

The New York Edison Company has established a Commercial School, engaging the highest authorities to instruct the employees in hygiene, health, recreation, business, the responsibilities of public service, something of commercial electrical engineering, of salesmanship, and of the organization of the Company itself; that Company has also recently organized a Savings and Building Loan Association.

The Milwaukee Electric Railway and Light Company and Associated Companies have established a Service Annuity System, Loan Fund and Mutual Benefit Association.

The Consolidated Gas, Electric Light and Power Company of Baltimore has adopted a Service Annuity Plan, issuing to the beneficiaries a Service Certificate, which is reproduced in facsimile in the Appendix.

Other plans are being seriously considered by many companies.

Labor Exchanges

Your attention is called to the very rapid development of a new movement in England—the organization of "Labor Exchanges." Through the establishment of these Exchanges a great deal of time, ordinarily lost, is saved by eliminating the necessity of employees going from place to place to secure employment—often without success. Vacancies and the character of the prospective work are recorded at convenient central points, enabling workingmen and women to go directly from Exchange to employment, thus saving time and effort, and increasing the earning power of the workers. Though barely two years old, it is stated that more than half a million persons will find employment through these Exchanges during the present year.

Minimum Wage

Another interesting experiment is taking place in the question of a "Minimum Wage" in various industries. We do not use this term in the sense of minimum wages to be paid to skilled workmen or members of trade unions, but to beginners and other unskilled workers, particularly women. In every community there is some point below which the worker cannot live. The amount will depend upon local conditions. The movement is brought to the attention of our membership as one of the interesting experiments of the times which may assume larger importance in future.

Underpaid Labor Undesirable

This leads us to repeat the general opinion, that underpaid labor is not desirable in any industry. The productive value of underpaid, and consequently underfed, men and women cannot be equal to that of those who have enough to provide at least the minimum required for good health and a reasonable degree of contentment. Fortunately, we think these observations are not particularly applicable to this industry, for, generally speaking, the wages paid are in excess of the average.

No community can afford to ask that a public service corporation shall underpay its employees or object to any wage in which there is sufficient allowance for relatively high standards of living, no matter in what department of industry the recipients may be engaged. This is as true of the men in the fire or engine rooms or engaged on the outside lines, as of the office force; it is as true of the women as of the men and of the men as of the women. Nothing can be more conducive to high service standards and to public confidence and support than a satisfied, contented, strong, healthy and vigorous body of employees.

Hygiene

Your Committee desires to call to the attention of our membership the importance of providing suitable hygienic conditions as a means of obtaining higher operating efficiency. We refer to toilet facilities, so often neglected, the supply of clean towels, of pure drinking water, and the provision for fresh air by adequate means of ventilation. These are features of present-day industrial life to which much attention is now being given in a great many, if not all, of our industries. In all of these matters electric light and power are important factors, and your Committee feels that here, as elsewhere, our industry should continue to be the leader—not the follower.

In connection with this subject, the work of the Commonwealth Edison Company during the past year will be of interest. Of 11,834 employee examinations made for indications of tuberculosis, the Company found 35 tubercular cases—24 of an incipient and 11 of an advanced nature. Of this number, 19 were transferred to outdoor positions in the Company's service; five were placed in positions in a more suitable climate; four recovered and returned to duty; three left the service of the Company; two, advanced cases, going to a more suitable climate, and three died; the Company's doctor reports that one only seems to now have no chance of recovery. It thus appears that of the 35 cases, incipient and advanced, 23 remaining in the service of the Company have good chance of full recovery; adding the five for whom positions were secured in another climate brings the total to 28 of the original number whose health has been restored through the Company's efforts in this direction.

Safety

This is as much an age of prevention as of cure, and means should be taken to prevent accidents, as well as to care afterward for the injured worker. Usually means for preventing accidents are surprisingly simple. Just as some years ago the agitation for direct-connected machine tools led to the development of the single unit of motor and tool, so present agitation for safety is leading to the construction of machinery in the design of which the safety of the worker is an important consideration.

A number of our larger industrial establishments employ a "Safety Engineer." In some the safety features of any new work are carefully checked on the plans before they are passed for final utilization. By increased watchfulness in this respect, one of the largest corporations of the country reported a reduction of 63 per cent in the number of accidents occurring last year compared with the preceding year; another reports 61 per cent, and still another 50 per cent.

Recognizing the importance of this new movement, the United States Government is having the various Navy Yards carefully surveyed in reference to human risk. The Denver Gas and Electric Light Company recently had all of its plants surveyed and reported upon through the American Museum of Safety. This action was widely and favorably commented upon by the press of the city.

No one can question the greater contentment and the enhanced efficiency in the work of the men whose safety is well assured. The cost, which we understand has been relatively small, shrinks into insignificance in comparison with the reduction in human suffering and individual loss of earning power under the more ordinary neglect of these matters until an accident occurs.

We urge upon our membership the investigation of every accident, and the adoption of such means as may be necessary to prevent a recurrence; the careful inspection of their plants to insure that no element of protection which modern development affords is missing, the lack of which might cause injury to their workmen.

"Welfare" Cost Analysis

So little information was available—at least from an insurance actuarial standpoint—upon the cost of Accident, Sickness and Health Insurance and of Service Annuities, as recommended in your Committee's report of last year, that the services of an Insurance Accountant familiar with the subject were secured during the year. In addition, our membership was asked for various items of information, of a statistical nature, relating to their employees, upon which the work of the expert could be based. Two hundred and eighty-eight companies replied in detail to our inquiries.

It is gratifying to know that a very large percentage of the companies reporting have adopted some form of "welfare" relationship which conforms with the recommendations of last year's report of your Committee. Thus of the two hundred and eighty-eight companies, one hundred and forty now provide free medical and surgical attendance, in the event of industrial illness or accident, and twenty-eight companies regularly employ physicians or surgeons for their employees; one hundred and thirty-nine companies continue their employees on the payroll at full pay during full or partial periods of illness; ten member companies now provide Service Annuities, eight have adopted some form of Profit Sharing, nineteen have Employees' Investment or Savings Fund Associations, and a similar number provide Life Insurance.

The report of the Accountant, Mr. J. D. Craig, forms the principal part of the Appendix to the report of your Committee. In reference to Service Annuities, the costs are based upon the accepted actuarial tables of the insurance companies. Some assumptions have been necessary. Thus it has been assumed that all employees will remain in the service of their employers throughout their full life expectation, and no allowances have been made for resignations or dismissals. Under this assumption the cost of providing Service Annuities would amount to 3.54 per cent of the payroll. As modified, however, with dismissals and resignations, the figure would be very much less, and undoubtedly within the estimates of your Committee, which approximate one per cent of the payroll. The report is recommended to the careful consideration of our membership.

Co-operative Insurance

Your Committee realizes that it may appear difficult for our smaller companies to assume or arrange for the payment of Service Annuities, or to indemnify their employees in the event of industrial sickness or accident. Yet, it seems that the employees of the industry should not be handicapped because they are connected with a small rather than a large company member.

One of the plans suggested to meet this situation is the organization of a Committee of Trustees, which, acting as a sort of "Clearing House" to our membership, would be able to get for each Company group, however small, the advantages accruing to the individuals in the larger groups. No definite plan has been evolved, but possibly one could be arranged if desired by the smaller Companies. An expression of opinion upon this point would be very gladly received by your Committee.

Respectfully submitted,

Committee

ARTHUR WILLIAMS, *Chairman*
N. F. BRADY
EVERETT W. BURDETT
H. M. BYLLESBY
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CHARLES L. EDGAR
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APPENDICES

A—Actuarial Analysis of the Cost of Maintaining Various Forms of Insurance Relationship.

B—Decision of the Kansas Public Utilities Commission in Refusing an Application for a Competitive Franchise at Parsons, Kansas.

C—Cost of Providing Industrial Accident Compensation to its Employees and to the General Public by the New York Edison Company Covering a Period of Six Years.

D—Service Certificate adopted by the Consolidated Gas Electric Light and Power Company of Baltimore.

APPENDIX A

ACTUARIAL ANALYSIS OF THE COST OF MAINTAINING VARIOUS FORMS OF INSURANCE RELATIONSHIP

New York, April 20, 1912.

Mr. Arthur Williams, *Chairman*
Public Policy Committee
National Electric Light Association
New York City, N. Y.

Dear Sir:

In the Report of your Committee as rendered to the Thirty-fourth Annual Convention of the National Electric Light Association in New York City, May 29 to June 2, 1911, it was recommended that, in the interest of efficiency and economy, employers of the Electric Industry should take a leading part in the development of the health, material welfare and happiness of their employees and in order to bring each into closer relationship with the other, it was specifically recommended, that each association should adopt as its own policy, or else should encourage its employees to adopt, any one of the following six plans for social betterment or uplift.

I Accident Insurance
II Sickness Insurance and Death Benefits
III Service Annuities
IV Profit-Sharing
V Employees' Savings and Investment Funds
VI Life Insurance

Four of the suggestions, Accident Insurance, Sickness Insurance and Death Benefits, Service Annuities and Life Insurance refer to subjects on which your Committee desires further study, and you therefore requested that I submit an outline from an actuarial view-point, giving special attention to the various costs, not only at the present time but in years to come; and in accordance with this request I herewith submit such data relative to each subject as I hope will enable you to formulate plans for organizing societies upon foundations which time will prove to be sufficient.

Each of the four benefits referred to me may be treated in different ways. They could all be managed through a single organization, or, each society could be the custodian of its own funds; also, the yearly costs could be charged to current expenses as they mature or average yearly premiums could be collected or set aside, according to whether the employees contribute, or the companies alone do the financing. When the costs are charged as current expenses, they will be relatively light in the early years, but increase as time passes, while with average yearly premiums, the collections will be in excess of the yearly costs for a time, after which they will fall below them, and the difference be met from the accumulation of earlier years.

The average yearly premiums will naturally be higher in the earlier years than the charge under the current expense plan, and consequently they are apt to be looked upon with disfavor by the organizers of societies or associations, but in the end they call for less actual outlay, as all accumulations can be invested and the interest returns applied toward the costs.

Before attempting to calculate any average or level yearly premiums, it becomes necessary to assume what per cent of interest will be earned on the accumulated funds. In determining what rate may be assumed it is necessary to look into the future, as a person now age 20 may live to be 100 years old and during all this time there would be some funds for investment. New York State has adopted 3½ per cent as a maximum for insurance companies, but certain companies in order to be doubly safe voluntarily make their calculation on a 3 per cent basis. At the present time, however, 5 per cent can be earned upon apparently safe investments, and, while the interest rate has fluctuated in the past, and will fluctuate in the future, it seemed as though the calculation for this purpose, when it is desired to produce as small premiums as are consistent with safety, might be upon a 4 per cent rate of interest, particularly if certain classes of investments not open to insurance companies are considered and certain other sources of profit availed of. I have therefore assumed that this rate will be earned upon all funds.

In order to secure the greatest efficiency in the investment of the funds as well as the best supervision of the various benefits proposed it is recommended that one central organization be given the entire management of the various plans suggested, although numerous local agencies have advantages, particularly in the supervision of sick benefits. Perhaps the greatest success could be obtained by organizing one general society and making the various associations local agents thereof.

In recommending the "Sickness Insurance and Death Benefits," it was estimated by your Committee "that, assisted by the employing company, etc.," the various benefits might be granted for the smallest consideration were the employees to contribute the actual costs and the companies to contribute enough to cover the expenses of management. In the tables of cost which follow, it is assumed that something of this nature will be done, and the tables therefore provide only for the actual cost of the benefits granted, without making any provision for expenses.

In addition to the interest and expense element, the rates of accidents, sickness and mortality must be seriously considered and tables for each adopted. The rate of accidents differs so much with each occupation, and, in fact, with each age, that if possible the rates fixed should be predicated upon the experience of the industry actually interested. No experience of this nature is given among the electric employees; hence, I hesitate about submitting any rates, and confine myself to generalities and to such other experience as is available.

The sick benefit rates are based upon the Manchester Unity Experience of 1893 to 1897 when nearly 3,000,000 years of life were exposed to risk, and over 7,000,000 weeks of sickness incurred. This experience included various occupations, some of which were hazardous, and it is believed that with proper supervision the sickness claims incurred will not exceed those provided for in the rates.

The rates for Service Annuities and Life Insurance are based upon the Combined Experience Table of Mortality. This table was the standard in New York State prior to 1901, and is used in the belief that it will safely provide the results desired.

Before discussing each one of the four benefits to be granted, I would call attention to the paucity of data contained in the reports submitted by the individual members of Class A. Some of these contained absolutely no information, others answered only one or two of the questions asked, while very few replied to all of them. As an illustration: Out of 256 companies reporting, only 136 gave the age classification of the members together with the payroll, and 101 combined the resignations and dismissals with the total number of employees; two companies reported the number of resignations and dismissals, but did not give the number of employees, while 32 did not even state the yearly payroll.

To profit by whatever information was contributed I had a card written for each report and then sorted the cards into individual subjects in order to get a complete classification of the items under investigation.

ACCIDENT INSURANCE

In discussing accident insurance your Committee reported that it "believed the cost of accidents inherent to our industry should not fall upon the individual employee or his dependents, but upon the industry as a whole."

In order to estimate the cost a classification was made to find out how many accidents were reported during the year out of a given number of employees, and what expenses were being incurred at the present time. It was found that 96 companies reported 4782 accidents among 28,211 employees with a pay roll of $22,009,751. Of the 96 companies, 33 with 9047 employees and a pay roll of $7,786,942 reported 1643 accidents and incurred a cost of $147,765; 26 with 19,532 employees and a pay roll of $15,297,732 reported 3344 accidents and legal fees $53,505; while 49 with 20,271 employees and a pay roll of $16,306,626 reported 3493 accidents and medical expenses of $36,171. While this experience is valuable as showing that on an average, 16.95 per cent of the employees met with accidents and that the total cost to 33 companies was nearly 2 per cent of the pay roll, it is deficient in that the accidents are not classified in detail. We are informed neither how many were fatal nor how much time was lost. Comparing these statistics with the first annual report of the Employers' Benefit Association of the International Harvester Company, we learn that the accident disability cases of that association were 19.48 per 100 against 16.95 per 100 among electrical employees, and we may therefore assume that the average time lost would be nearly the same in both industries. The average time lost by the Harvester Association employees was 1.78 days per member, or on the basis of 360 days to a year, nearly one half of one per cent.

Mr. Edward Bunnell Phelps in a short article entitled, "Workmen's Compensation—a Study of its Probable Cost to the Community," in the *American Underwriter* for February, 1912, presents some statistics gathered from the finding of the United States Employees' Liability and Workmen's Compensation Commission, and reaches the conclusion that the probable outside cost to American industries in general from even such an extremely liberal workman's Act as that which Congress is now considering, would not be over 1½ per cent of the annual pay roll. This conclusion is based upon the experience of 880,572 men employed by railroads, where the occupation is looked upon as hazardous, and Mr. Phelps believes that in non-hazardous occupations the benefits might not exceed 1 per cent of the pay roll.

While this particular phase of the subject should be seriously considered and measures adopted, if possible, in advance of compulsory legislation, there is one benefit advocated which seems to be very, perhaps even extremely, liberal, especially when compared with the proposed bills of the day, and that is Subdivision 1 under "D" of your Committee's Report. This proposes, in the event of death from accident, to pay "to his dependents, should there be any, during the employee's expectation of life, under the assumptions of the American Experience Table of Mortality." The employee's expectation of life is a relatively long time. For a person aged 20 it is 42 years, so that if a person aged 20 is killed by accident, the proposition is to pay a benefit to his dependents for 42 years and the present value of this at 4 per cent interest would be 21 times the annual allowance.

While, of course, the expectation is shorter on the more advanced ages, being, however, nearly 14 years at age 60, the liberality of the proposition is manifest when it is observed that according to the recent bill presented at Washington applicable to common carriers engaged in interstate and foreign commerce, the benefit in event of death from accident ranges from 15 per cent to 50 per cent of the salary, but must be paid for only eight years, while the final draft of the Act providing compensation for workmen injured in hazardous industries, as advocated by the National Civic Federation through its Department on Compensation for Industrial Accidents and Their Prevention, provides for a death benefit in case of fatal accident equal to only four years' earnings of the victim of the accident (but in no case to exceed $3,000).

It is also open to question whether your Committee, under "B," is not too liberal in its recommendation that, at the expiration of six months the wages should be continued at one-half the full wage for life or during disability, etc.

While it would seem only humanitarian to continue the half wage for life, the remarks of Mr. Alfred W. Watson in a recent article presented to the Institute of Actuaries in Great Britain, appearing in volume 44 of the *Insurance Magazine,* should be carefully noted. They refer more particularly to Sickness Benefits and should be remembered when considering that subject, but accident insurance and sickness insurance are so closely allied that the remarks may with safety be given here.

"Logically there is no defence to the charge that it is absurd to reduce the benefit as the duration of sickness increases and the impoverishment of the sufferer increases. Ansell asserted this view with considerable emphasis in his 'Friendly Societies' (1835). Effective, however, as criticism of the practise may be from the philosophic standpoint, it fails to take into account one potent factor—human nature. The manual worker, if not indeed mankind generally, adapts himself to his circumstances more frequently than he attempts to govern them. Six months of incapacity will generally—a longer period will invariably—so far weaken the habit of routine labor as almost to destroy it; whilst it is remarkable how small an income can be made to suffice, when the urgings of financial responsibility have been silenced. For this reason, continuous full sick pay has nearly always had to be abandoned, and continuous half pay is fast following it."

Bearing in mind this comment on human nature, it is suggested that the disability benefit be reduced at the end of a year to one-quarter of the full wages or, at least, the power to do so be reserved.

The bill proposed by the National Civic Federation limits the benefit to $10 a week and in no case continues it for more than 10 years nor after the recipient has reached age 60 unless he was over 55 when the accident occurred.

While the members of the National Electric Light Association are undoubtedly familiar with the Employers' Liability contracts offered by various casualty and accident companies, together with the rates charged therefor, nevertheless emphasis can be laid upon the various phases of the electrical hazards and the viewpoint of the casualty or accident companies in reference thereto, by mentioning a few of their rates, and accordingly some from the "Manual of Liability and Workman's Compensation Insurance" are given. These rates are probably higher than necessary for similar benefits when granted gratuitously by the employing companies, as they include a margin for expenses and contingencies, but they convey some idea of the liberality expected to be shown to injured employees by juries and judges as well as by Legislatures.

PERCENTAGE OF THE PAY ROLL REQUIRED UNDER THE LIABILITY AND WORKINGMAN'S COMPENSATION INSURANCE MANUAL TO SECURE INDEMNITY FOR ALL COURT AWARDS OR PRIVATE SETTLEMENTS UP TO $5,000 ON ONE LIFE OR $10,000 ON ONE ACCIDENT

	State of New York		State of Illinois	
Electric Light and Power Companies	Employer Liability	Public Liability	Employer Liability	Public Liability
Operation, maintenance, extension of lines, and making of service connections	4.00	7.00	7.20	7.00
Transmission lines, not for local distributions	4.00	3.50	7.20	3.50
Office employees not exposed to operating hazard	.10	.05	.60	.05
Electrical apparatus, erection and repair work only, including the making of service connections and the installation of equipment in power plants excluding the erection of poles and stringing of wire.	2.00	.50	3.60	.50
Electrical equipment, installation within buildings exclusively, including the making of service connections, but excluding the installation of dynamos and equipment in power plants	1.25	.25	2.10	.25
Placing electrical wires in conduits	2.25	.50	4.05	.50
Railroad construction (electric)	2.50-3.00	1.00-3.00	4.50-5.40	1.00-3.00
Telegraph and Telephone Companies operation, maintenance, extension of lines, and making of service connections	3.00	3.00	5.40	3.00
Office and exchange employees only	.10	.05	.60	.05

Sickness Insurance and Death Benefits

Sick benefit associations are generally started with a mutual desire to benefit the members but with little knowledge on the part of the originators. This is well brought out by the Grand Master of the Independent Order of Odd Fellows, Manchester Unity Friendly Society, where, in discussing the development of the Society, he states, "Out of the funds which naturally accumulated from the small weekly contributions called for in those early days, our benevolent predecessors in the largeness of their hearts, promised (and paid for a time) benefits in sickness and at death out of all proportion to the sums demanded as subscriptions." It should be clearly brought out that health insurance is expensive and resembles life insurance in that the older the insured the more expensive is the insurance. It is therefore just as inequitable to charge a uniform rate at all ages for health insurance as it is for life insurance. As earlier stated, the experience of the above-mentioned Manchester Unity for the years 1893 to 1897 has been published, together with tables of premiums, and we can avail ourselves of these as a minimum standard. In case they appear excessive it should be borne in mind as has been stated by an eminent student of the subject that "Health insurance calls for exceedingly high premiums, and further, it is not possible to bring the premiums down to 5 or 10 cents weekly without reducing the corresponding benefits to most insignificant proportions." From the experience given, premiums have been calculated for a sick benefit of $1 per week to continue during the entire sickness of the insured, and these weekly premiums are herewith submitted for all ages from 20 to 65:

WEEKLY PAYMENT FOR SICK BENEFIT OF $1 PER WEEK
WHOLE LIFE 4 PER CENT INTEREST

Age	Premium	Age	Premium	Age	Premium	Age	Premium
20	$0.04	32	$0.06	44	$0.10	56	$0.18
21	.04	33	.06	45	.10	57	.19
22	.04	34	.06	46	.11	58	.20
23	.04	35	.07	47	.11	59	.22
24	.05	36	.07	48	.12	60	.23
25	.05	37	.07	49	.13	61	.24
26	05	38	.08	50	.13	62	.26
27	.05	39	.08	51	.14	63	.28
28	.05	40	.08	52	.15	64	.29
29	.05	41	.09	53	.15	65	.31
30	.06	42	.09	54	.16		
31	.06	43	.09	55	.17		

while your Committee estimated that, "assisted by the employing company, co-operative associations can contribute approximately 50 per cent of the employees' wages when sick," etc. It would seem from Mr. Watson's remarks as quoted in connection with accident insurance that sick benefits should be reduced after a certain period. In further emphasis of this, Mr. Watson quoted as follows from the remarks made by Mr. Tidd Pratt, the then Registrar of Friendly Societies, in the course of evidence given in the inquiry of the Poor Law Commissions of 1834:

"I made inquiries amongst some of the most intelligent and respectable of the laboring classes as to what should be the extent of allowance to those who were out of work. I suggested to the parties that one-half the usual wages might be a proper allowance. The unanimous reply of all the operatives with whom I conversed on the subject was that an allowance of one-third would be ample, and that more than that would only induce the members to continue on the society rather than endeavor to find work."

Mr. Watson, in discussing the county and district societies, also says:

"At one time the county societies very generally provided continuous half sick pay, and their experience of this benefit became unfavorable in marked degree before the affiliated orders encountered the same disquieting feature. In several cases the continuous benefit has now been reduced to quarter pay, and this reduction having been followed by a general improvement in sickness rates, due partly, perhaps, to the reduction in question, but also to the adoption of more effective methods of supervision, the financial position of these excellent bodies has been improved to an extent that may be called remarkable."

In this last paragraph reference is made to effective methods of supervision as being a very material factor with societies on the other side where individual lodges often undertake the sickness liability, leaving to the districts the death benefits. The comment is made that the system is administratively good, whereas in discussing the National Association in which all administrative work is performed by the chief office, it is remarked "the system is thus open to criticism in assigning the important work of supervision to those who are not directly responsible for the moneys disbursed." If a central society is organized to provide sickness benefits for all of the affiliated companies, it is evident that the question of supervision should be given serious consideration in order to check excessive claims.

Another point that should be considered is the amount of sick pay, as experience has proved that the larger the scale the greater the relative amount of sickness. Mr. Watson presented three scales, one where the benefit was 10 shillings per week, and which showed an actual experience of 128 per cent of the expected; another, where the weekly benefit was 15 shillings per week, and which showed an actual experience of 184 per cent of the expected, and one where the weekly benefit was 20 shillings per week and showed an actual experience of 203 per cent.

As it is the intention of the proposed co-operative association to pay sick benefits of one-half the salary, the importance of considering the varying wage scales is manifest and it would seem wise to place a maximum upon the amount of sick benefit which the Association will grant to one person.

During the last twenty-five years great efforts have been made to spread the assurance of annuity benefits in lieu of sick pay in old age, and in view of the proposed plan on the part of the companies to grant service annuities commencing with males at age 65, there does not appear to be any reason why the sick benefits should not cease at that age, and the suggestion is therefore made that, instead of adopting the premium rates previously submitted, another scale limiting the benefit to age 65 be adopted. In like manner the benefit for females should be limited to age 60, and weekly premiums for both plans are herewith submitted:

WEEKLY PREMIUM TO PROVIDE CONTINUOUS BENEFIT OF $1 A WEEK

Males				Females			
Benefit until age 65				Benefit until age 60			
Age	Premium	Age	Premium	Age	Premium	Age	Premium
16	$0.03	41	$0.05	16	$0.03	88	$0.04
17	.03	42	.06	17	.03	39	.04
18	.03	43	.06	18	.03	40	.05
19	.03	44	.06	19	.03	41	.05
20	.03	45	.06	20	.03	42	.05
21	.03	46	.07	21	.03	43	.05
22	.03	47	.07	22	.03	44	.05
23	.03	48	.07	23	.03	45	.05
24	.03	49	.07	24	.03	46	.06
25	.03	50	.08	25	.03	47	.06
26	.03	51	.08	26	.03	48	.06
27	.04	52	.08	27	.03	49	.06
28	.04	53	.09	28	.03	50	.07
29	.04	54	.09	29	.03	51	.07
30	.04	55	.10	30	.03	52	.07
31	.04	56	.10	31	.03	53	.08
32	.04	57	.11	32	.04	54	.08
33	.04	58	.11	33	.04	55	.08
34	.04	59	.12	34	.04	56	.09
35	.04	60	.12	35	.04	57	.10
36	.05	61	.13	36	.04	58	.11
37	.05	62	.14	37	.04	59	.11
38	.05	63	.14				
39	.05	64	.15				
40	.05						

These premiums provide for a continuous benefit of $1 a week until age 60 or 65, but were the benefit reduced at the end of six months and again at the end of a year, the premiums would be reduced likewise. At age 40 the weekly premium to secure full benefit during the first six months of sickness, half benefit during the second six months of sickness and one-quarter benefit thereafter up to age 65, would be 4 cents instead of the 5 cents required to continue the full benefit. Considering that the premiums for the continuous full benefit are upon a net basis with 4 per cent interest, it is suggested that they be the premiums charged, but, that the benefits be reduced to half during the second six months and to one-quarter thereafter.

SERVICE ANNUITIES

In none of the proposed benefits is the difference between a level annual premium and the meeting of each year's claims as they occur so pronounced as with service annuities. By paying the current annuities as running expenses, the cost starts at a minimum and is relatively so small that unless studied closely it is apt to give a wrong impression regarding future years. When actually adopted, the yearly cost must increase from year to year and posterity is presented with a pretty heavy burden. Should any company after adopting such a plan ever cease to do business, a gross injustice would be done the remaining annuitants who are left unprovided for, but who produced the larger values from which the earlier employees received their annuities, as explained later on.

As this is of such vital importance, it is essential that a complete understanding be had, and, in order that the underlying principles may be clearly impressed upon our members the table on the next page is presented for careful consideration.

These figures are taken from the Combined Experience Mortality table, and represent the living from ages 90 to 100. The high ages are selected in order that the table, though short, may be complete. Ages more in harmony with actual conditions could have been chosen, but the sole object of the table is to make clear the principles involved, and the use of younger ages, would, by requiring too long a table, detract from the simplicity of the illustration without offering any compensating advantages.

According to this Combined Table, 1319 people are alive at age 90 of whom 427 die during the year, leaving 892 alive at age 91, and this number is diminished by death each year, so that at age 92 there are only 570 alive, at age 93, 339; at age 94, 184; at age 95, 89; at age 96, 37; at age 97, 13; at age 98, 4, and at age 99, 1.

TABLE SHOWING FOR 20 YEARS THE NUMBER OF EMPLOYEES, SUBDIVIDED ACCORDING TO WHETHER ACTIVE OR SUPERANNUATED, MAINTAINED BY 1319 NEW ENTRANTS EACH YEAR FOR 11 YEARS

	1st yr	2d yr	3d yr	4th yr	5th yr	6th yr	7th yr	8th yr	9th yr	10th yr	11th yr	12th yr	13th yr	14th yr	15th yr	16th yr	17th yr	18th yr	19th yr	20th yr
	1319	892	570	339	184	89	37	13	4	1										
	1319					**89**														
		1319	892	570	339	184	89	37	13	4	1									
		2211					**126**													
			1319	892	570	339	184	89	37	13	4	1								
			2781					**139**												
				1319	892	570	339	184	89	37	13	4	1							
				3120					**143**											
					1319	892	570	339	184	89	37	13	4	1						
					3304					**144**										
						1319	892	570	339	184	89	37	13	4	1					
						3304					**144**									
							1319	892	570	339	184	89	37	13	4	1				
							3304					**144**								
								1319	892	570	339	184	89	37	13	4	1			
								3304					**144**							
									1319	892	570	339	184	89	37	13	4	1		
									3304					**144**						
										1319	892	570	339	184	89	37	13	4	1	
										3304					**144**					
											1319	892	570	339	184	89	37	13	4	1
											3304	**1985**	**1093**	**523**	**184**	**144**	**55**	**18**	**5**	**1**
Total	1319	2211	2781	3120	3304	3393	3430	3443	3447	3448	3448	2129	1237	667	328	144	55	18	5	1

The assumption upon which the table is prepared is that a company employs 1319 men at age 90 with the promise that at age 95 they will each be retired with a service annuity. The next year the company again hires 1319 employees with the same promise, and in like manner hires 1319 people at age 90 each year for 11 years, after which it ceases to hire any employees and eventually retires from business. This hypothesis is made in order that certain distinct phases may be brought out. These phases may be termed the growing, stationary and declining periods. At present the status of the various companies is comparable to the growing period, but the stationary period will eventually be reached, and possibly the declining.

In the growing period, the company starts with 1319 employees at age 90; these are reduced to 892 at the end of the year, at which time 1319 more are employed, so that the company starts the second year with 2211 employees, the third year with 2781, the fourth year with 3120, and the fifth year with 3304. Commencing the sixth year, 89 of the first 1319 employees become eligible for annuities, having attained age 95; so that the company has enrolled 3304 employees on the pay roll and 89 on the annuity roll. The next year 37 out of the 89 just mentioned still being alive, they are entitled to the continuation of their annuities, while another 89 from the second lot of 1319 employees become eligible, making a total of 126 annuitants, with 3304 still as the number of employees on the pay roll. This growth of annuitants continues until the number is 139 at the end of the eighth year, 143 at the end of the ninth year, and 144 at the end of the tenth year; but the number of employees on the pay roll remains constant at 3304.

The stationary period would then continue as long as 1319 new employees were added at age 90. It will be noticed that 144 annuitants represent 4.3 per cent of the 3304 active employees, but in order to avoid a wrong impression it must be borne in mind that the table is taken for illustration based upon the end of the mortality table, and that a more complete set of figures would show a higher percentage. Were a similar table prepared starting at age 20 the annuitants would represent nearly 16 per cent of the active employees by the time the stationary period arrived. While it is probable that the stationary period would last for a long time, the possibility of a declining period must never be overlooked. It commences as soon as the company ceases to take on the stipulated number of employees. Assuming, as we did in our illustrative table, that this was at the end of the eleventh year, the company starts the twelfth year without the 1319 new employees and consequently with only 1985 on the pay roll with the regular number, 144, of annuitants. The number of annuitants would remain constant for the twelfth, thirteenth, fourteenth, fifteenth and sixteenth years despite the fact that the number of employees on the pay roll was constantly diminishing, being 1093 at the beginning of the thirteenth year, 523 at the beginning of the fourteenth year, 184 at the beginning of the fifteenth year, and none thereafter. Commencing with the sixteenth year, the company would have no employees on the pay roll, but 144 still on the annuity roll.

Special note must be taken of the fact that the decline in the number of annuitants does not begin until a number of years after the decline in the number of active employees and at the start of this latter period the percentage commences to increase. Eventually the entire personnel of the company consists of annuitants who have been led to expect that their annuities would be provided from the earnings of active employees in the same manner that their earnings, when they were active, provided for their predecessors. As no active members are left, it is evident that their expectation will not be realized, and that they will be victims of a plan adopted years before upon a faulty basis.

The following table shows the number of active employees, the number of annuitants each year, and the ratio of active employees to annuitants.

Year	Total	On Pay Roll (Not 95 or over)	On Annuity List (95 or over)	Percent of Col. 4 to Col. 3
1st	1319	1319	0	
2nd	2211	2211	0	
3rd	2781	2781	0	
4th	3120	3120	0	
5th	3304	3304	0	
6th	3393	3304	89	2.69
7th	3430	3304	126	3.81
8th	3443	3304	139	4.21
9th	3447	3304	143	4.33
10th	3448	3304	144	4.36
11th	3448	3304	144	4.36
12th	2129	1985	144	7.25
13th	1237	1093	144	13.17
14th	667	523	144	27.53

Year	Total	On Pay Roll (Not 95 or over)	On Annuity List (95 or over)	Percent of Col. 4 to Col. 8
15th	328	184	144	78.26
16th	144	0	144	
17th	55	0	55	
18th	18	0	18	
19th	5	0	5	
20th	1	0	1	

As mentioned before, the present status of the various companies is comparable to the growing period. This may be more clearly realized by examining columns 6 and 7 of the illustrative table and reversing the figures so that the younger ages appear at the top instead of at the bottom. Thus there are living:

At age	Col. 6	Col. 7
90	1319	1319
91	892	892
92	570	570
93	339	339
94	184	184
95	89	89
96	37	37
97		13

In both tables the number below age 95 (the age at which we assume annuities to begin) far exceeds the number above, just as with any company the number of active employees below age 65 (the age at which it is proposed to grant service annuities) far exceeds the number above. Also, neither column 6 nor 7 is complete, as, according to the suppositions made, enough time has not elapsed to permit of any employee attaining ages 98 or 99. This is likewise analogous to the conditions of the company where no employees have had time to attain age 80, 85, 90 or 95.

On account of the younger ages of employees in practical business, the proportion of active employees is probably greater than that shown in either column 6 or 7, but the idea of the table is to show the natural trend of the relative propositions and to point out the effect in later years. Were a smaller per cent desired, it would only be necessary to take column 5 when all employees are active and none superannuated.

For the purpose of comparison, the level average premium payable for five years for each active employee is accumulated, and a table submitted showing the sufficiency of the accumulation, and it is believed the table is elementary enough to be easily followed.

FIVE-YEAR DEFERRED ANNUITY PAYABLE BY 5 ANNUAL PREMIUMS
AGE 90—-ANNUAL PREMIUM PER $1—.0366493

Age	No. Living to pay Premium	Fund Beginning of Year	Total Annual Prem. Payable	Total	Total with 4% Int.
90	1319	0	$48.3404	$48.3404	$50.2740
91	892	$50.2740	32.6912	82.9652	86.2838
92	570	86.2838	20.8901	107.1739	111.4609
93	339	111.4609	12.4241	123.8850	128.8404
94	184	128.8404	6.7435	135.5839	141.0073
	No. Living to receive Annuity	Fund Beginning of Year	Annuities Paid	Difference	Difference with 4% equals fund at end of year
95	89	$141.0073	$89.00	$52.0073	$54.0876
96	37	54.0876	37.00	17.0876	17.7711
97	13	17.7711	13.00	4.7711	4.9619
98	4	4.9619	4.00	.9619	1.000
99	1	1.0000	1.00	.000	.000

The fund of $141.01 may be accumulated in another way which offers certain advantages. Were $0.0879 deposited for each of the 1319 members at age 90, a fund of $115.90 (1319 × $0.0879) would be created which, improved at four per cent interest, would amount to $120.53 at the end of one year, $125.35 at the end of two years and so on until at the end of five years it would amount to $141.01. In similar manner were $0.13513 deposited for each of the 892 members at age 91, a fund of $120.53 would be created which, improved at 4 per cent interest, would amount to $141.01 at the end of four years. The fact that the fund created by 892 members at age 91 is the same as the fund created by 1319 members at age 90, after it has been improved at interest, is not a coincidence, but the result of an actuarial calculation.

Of course where an annuity of $1 only is to be provided, there is no object in creating the fund at age 90 and then again at 91 or any other age, but where an annuity of five dollars is desired, and it is found inexpedient to pay five times the average annual premium of $.0366 or $.1830, the same ultimate result can be accomplished by creating the fund for a $1 annuity at age 90 with a deposit of $.0879, and in like manner creating a fund for a $1 annuity at ages 91, 92, 93 and 94, the deposits being .13513 at age 91; .21992 at age 92; .38457 at age 93, and .73687 at age 94.

Leaving the examples deduced from our illustrative table and considering the real problem presented by your Committee of securing Service Annuities for male employees attaining age 65 and female employees attaining age 60, we may pass over the plan of providing current annuities as a yearly expense by remarking that at present the reporting companies have practically no employees over these ages, and would therefore incur but little cost, but, as explained above, would transfer the heavy burden to the future.

Before considering either of the two methods of accumulating funds, it will be better to have tables for each, and they are presented herewith—one set for males, shows the average yearly premium at ages 18-63 to secure an annuity of $1 at age 65, and the single deposit necessary at each age to secure the same benefit, while the other for females, shows both average yearly premiums and single deposits necessary to secure an annuity of $1 at age 60.

TABLE SHOWING AVERAGE YEARLY PREMIUMS AND SINGLE DEPOSITS TO SECURE ANNUITY OF $1, COMMENCING AT AGES 65 AND 60

Males [Annuity at 65]			**Females** [Annuity at 60]		
Age	Average Yearly Premiums Premiums	Single Deposits Premiums	Age	Average Yearly Premiums	Single Deposits
18	$0.036	$0.69	18	$0.064	$1.19
19	.036	.72	19	.068	1.24
20	.041	.76	20	.072	1.30
21	.043	.79	21	.076	1.36
22	.045	.83	22	.080	1.44
23	.048	.87	23	.085	1.50
24	.051	.91	24	.090	1.57
25	.054	.96	25	.096	1.64
26	.057	1.00	26	.102	1.72
27	.060	1.05	27	.108	1.81
28	.064	1.10	28	.115	1.89
29	.068	1.16	29	.122	1.99
30	.072	1.21	30	.131	2.08
31	.077	1.27	31	.139	2.18
32	.082	1.33	32	.149	2.29
33	.087	1.40	33	.158	2.40
34	.093	1.47	34	.170	2.52
35	.099	1.54	35	.183	2.65
36	.106	1.62	36	.196	2.78
37	.113	1.70	37	.211	2.92
38	.121	1.79	38	.228	3.07
39	.130	1.88	39	.246	3.22
40	.140	1.97	40	.266	3.38
41	.150	2.07	41	.289	3.55
42	.162	2.18	42	.314	3.74
43	.174	2.29	43	.343	3.93
44	.189	2.41	44	.376	4.13
45	.205	2.53	45	.414	4.35
46	.224	2.67	46	.457	4.58
47	.244	2.81	47	.508	4.82
48	.267	2.96	48	.568	5.09
49	.294	3.12	49	.639	5.37
50	.324	3.30	50	.726	5.66
51	.360	3.49	51	.832	5.99
52	.401	3.69	52	.967	6.33
53	.450	3.91	53	1.141	6.71
54	.509	4.14	54	1.375	7.11
55	.580	4.40	55	1.705	7.55
56	.669	4.67	56	2.202	8.02
57	.780	4.98	57	3.034	8.54
58	.924	5.30	58	4.705	9.11
59	1.119	5.67	59	9.731	9.73
60	1.395	6.07			
61	1.811	6.51			
62	2.510	6.99			
63	3.916	7.53			

When a young man enters the employ of the companies at age 18, there is a prospect of forty-seven years of work before he attains age 65 and becomes eligible for a Service Annuity. Considering the amount of the annuity therefore as $47, the level annual premium necessary is .036 × 47 or $1.69. In like manner the level annual premium necessary at each age in both males and females is ascertained according to the following tables:

AVERAGE YEARLY (ANNUAL) PREMIUM TO PURCHASE AN ANNUITY

Males

First Payment at age 65

Age	For amt. of $1.00	No. of Dollars	Product
18	.036	47	1.69
19	.038	46	1.75
20	.041	45	1.85
21	.043	44	1.89
22	.045	43	1.94
23	.048	42	2.02
24	.051	41	2.09
25	.054	40	2.16
26	.057	39	2.22
27	.060	38	2.28
28	.064	37	2.37
29	.068	36	2.45
30	.072	35	2.52
31	.077	34	2.62
32	.082	33	2.71
33	.087	32	2.78
34	.093	31	2.88
35	.099	30	2.97
36	.106	29	3.07
37	.113	28	3.16
38	.121	27	3.27
39	.130	26	3.38
40	.140	25	3.50
41	.150	24	3.60
42	.162	23	3.73
43	.174	22	3.83
44	.189	21	3.97
45	.206	20	4.12
46	.224	19	4.26
47	.244	18	4.39
48	.267	17	4.54
49	.294	16	4.70
50	.324	15	4.86
51	.360	14	5.04
52	.401	13	5.21
53	.450	12	5.40
54	.509	11	5.60
55	.580	10	5.80
56	.668	9	6.01
57	.780	8	6.24
58	.924	7	6.47
59	1.119	6	6.71
60	1.395	5	6.98
61	1.811	4	7.24
62	2.510	3	7.53
63	3.916	2	7.83

Females

First Payment at age 60

Age	For amt. of $1.00	No of Dollars	Product
18	.064	42	2.69
19	.068	41	2.79
20	.072	40	2.89
21	.076	39	2.96
22	.080	38	3.04
23	.085	37	3.15
24	.090	36	3.24
25	.096	35	3.36
26	.102	34	3.47
27	.108	33	3.57
28	.115	32	3.68
29	.122	31	3.79
30	.131	30	3.93
31	.139	29	4.03
32	.149	28	4.17
33	.158	27	4.27
34	.170	26	4.42
35	.183	25	4.58
36	.196	24	4.71
37	.211	23	4.86
38	.228	22	5.02
39	.246	21	5.17
40	.266	20	5.32
41	.289	19	5.49
42	.314	18	5.65
43	.343	17	5.83
44	.376	16	6.02
45	.414	15	6.21
46	.457	14	6.40
47	.507	13	6.60
48	.568	12	6.82
49	.639	11	7.03
50	.726	10	7.26
51	.832	9	7.49
52	.967	8	7.74
53	1.141	7	7.99
54	1.375	6	8.25
55	1.705	5	8.53
56	2.202	4	8.81
57	3.034	3	9.10
58	4.705	2	9.41
59	9.731	1	9.73

It will be observed that the average annual cost ranges from $1.69 up to $7.83 where the annuity is based upon $1 for each year between 65 and the age at entry, or, in other words, for each year of service. If $1 as the basis of the annuity also represents 1 per cent of the pay roll, it follows that Service Annuities of 1 per cent of the pay roll, provided it remains constant, will necessitate an outlay of from 1.69 to 7.83 per cent of the same pay roll if all employees remain continuously with the companies.

In order to determine at about what point between these two extremes the actual per cent would fall, the following schedule was prepared, based on average ages and average amounts, but with an additional supposition, to wit: That the employees had already been with the companies a number of years varying according to age, but ranging from 1 to 5 years, as shown in the column headed "Years with the Company (approximated)."

COMPANIES REPORTING AGE CLASSIFICATION OF EMPLOYEES, TOGETHER WITH PAY ROLL

Number of companies		136
Total pay roll		$10,265,048.00
Number of employees:		
Male	12,315	
Female	657	
Total	12,972	
Average salary		$791.00
One per cent average salary		7.91

SCHEDULE SHOWING TOTAL LEVEL ANNUAL PREMIUM TO SECURE ANNUITY FOR EMPLOYEES OF 136 COMPANIES ACCORDING TO ASSUMPTIONS MADE ON PREVIOUS PAGE

Ages under	Average age	Number of employees	Years before reaching ages 65 or 60.	Years with Company approx.	Total yrs. for service annuities	Amt. of annuity equals yrs. times 1% aver. salary	Annual cost of annuity of previous col.	Annual cost of annuity for all
				MALES				
15	13	20	52	1	53	$419.23	$11.71	$234.20
15-20	18	873	47	2	49	387.59	14.10	12,309.30
20-25	23	2531	42	2	44	348.04	16.67	42,191.77
25-30	28	2836	37	3	40	316.40	20.23	57,372.28
30-35	33	2172	32	3	35	276.85	24.05	52,236.60
35-40	38	1563	27	4	31	245.21	29.68	46,389.84
40-45	43	1046	22	4	26	205.66	35.97	37,624.62
45-50	48	605	17	5	22	174.02	46.53	28,150.65
50-55	53	350	12	5	17	134.47	60.53	21,185.50
55-60	58	203	7	5	12	94.92	87.74	17,811.22
over 60	63	116	2	5	7	55.37	216.83	25,152.28
Total		12,315						$340,658.26
				FEMALES				
Under 15	0							
15-20	18	103	42	2	44	$348.04	$22.33	$2,299.99
20-25	23	229	37	2	39	308.49	26.28	6,018 12
25-30	28	152	32	3	35	276.85	31.85	4,841 20
30-35	33	80	27	3	30	237.30	37.74	3,019.20
35-40	38	40	22	4	26	205.66	46.80	1,872.00
40-45	43	22	17	4	21	166.11	57.02	1,254.44
45-50	48	15	12	5	17	134.47	76.37	1,145.55
50-55	53	9	7	5	12	94.92	108.31	974.79
55-60	58	5	2	5	7	55.37	186.09	930.45
over 60	63	2		5	5	39.55	374.30	748.60
Total		657						$23,104.34
Total for males and females								$363,762.60

It is doubtful if this schedule needs elucidation, but in order to clarify it as much as possible the following explanation of the male figures for ages 15 to 20 is given. One hundred and thirty-six companies reported 873 men between these ages and we have assumed the average age to be 18. If annuities begin at age 65, and if the average age is eighteen years, it is evident that they are deferred 47 years; while if the employees have been with the company two years, they will have served 49 years at the time they enter upon their annuities. The average salary is $791 and one per cent of this is $7.91, so that if these employees receive one per cent of the average salary for each year of service, they will get a total annuity of 49 per cent of the average salary, or $387.59. The average annual cost of such an annuity is $14.10, and the annual cost of 873 such annuities is $12,309.30. In preparing the schedule it was necessary to assume that the salary was the same at all ages, and that the employees had been with the company a specified number of years as shown in the schedule. It is probable that both of these assumptions are wrong, and that the older men receive salaries in excess of that average, while the younger men receive salaries below the average. It is also probable that the older men, particularly those receiving the higher salaries, have been with the companies longer than the time allowed in the table; but the calculations based on these assumptions show a total cost of $363,762 or 3.54 per cent of the pay roll. This is greatly in excess of one per cent, and would be increased if the salaries and durations on the higher ages were more than allowed in the schedule.

There is, however, a contingency of great importance entering into the practical affairs of the companies which is not included in the calculations thus far made, but which will reduce the cost materially, and that is the resignations and dismissals. In making the annual premium of $14.10, it was assumed that all of the 873 members with the exception of those who died before reaching age 65 would be entitled to the Service Annuity, while in actual business only those surviving and still in the employment of the companies would be eligible. It is therefore important in order to obtain more accurate annual premiums that we should know approximately how many men resign or are dismissed from the companies each year. In order to gather what information was available we examined the reports submitted and among the 136 companies reporting the age classification together with the total pay roll, 85 report either resignations or dismissals or both; while 51 report no resignations or dismissals.

Classifying the reports with respect to these two subjects the results are:

CLASSIFICATION OF REPORTS SUBMITTED WITH RESPECT TO RESIGNATIONS AND DISMISSALS

	No. of Companies	Employees male & female	Resignations	Dismissals	Pay Roll
Reporting age classification and pay roll	85	7,593	1,996	2,020	$5,754,502
Not reporting age classification and pay roll	12	3,385	774	1,003	2,713,507
Reporting total number of employees only	4	97	7	1	
	101	11,075	2,777	3,024	
Reporting resignations and dismissals	2		15	5	100,720
Reporting no resignations or dismissals	125	22,225			16,963,732
Reporting no salary	17	360			
Reporting pay roll only	2				173,455
Not reporting	11				
Total companies	258				

This classification shows that 101 companies with 11,075 employees, reported 2,777 resignations and 3,024 dismissals, a total of 5,801 resignations and dismissals, or over 50 per cent. While it shows the importance of considering this phase of the subject, it does not give any assistance as to the resignations and dismissals by ages or by years. Even if it did, the experience under a new order, with Service Annuities, would probably be different.

The importance of the resignations and dismissals by ages is apparent from a glance at the following table of secession rates for a railway society, consisting of some 30,000 members engaging chiefly in traffic operations:

SECESSION RATES PER CENT

Age	Experience 1901-1905
15-19	19.12
20-24	11.21
25-29	4.64
30-34	1.99
35-39	.98
40-44	.59
45-49	.59
50 or over	.21

Including this rate of secession in the calculation, the level annual premium per $1 at age 40 would be decreased from $.140 to $.132 and the annual premium for $25 from $3.50 to $3.30. While the rate of secession is greater in the electric companies, it is doubtful if it is enough greater, particularly at the higher ages, to reduce the cost to one per cent of the pay roll.

The above outlined level annual premium plan is the one preferred by an actuary, as it requires the largest initial payment, and attracts attention to the real cost of the benefits proposed, but on this very account, combined with uncertainty regarding the actual amount of annuity, as well as the greater detail required in keeping accurate account of the financial standing, it is often looked upon as prohibitive.

As an alternative proposition, therefore, it is suggested that the necessary funds be accumulated by yearly single deposits, each one sufficient to secure at age 65 an annuity of one per cent of the current year's salary.

At age 18 the Company could secure an annuity of $7.91 a year, first payment at age 65, by paying $5.47 in one sum. This makes the contract for the year complete in itself, and not contingent upon any further payment or consideration. By allowing the $5.47 to accumulate at four per cent for forty-seven years, a sufficient fund would be accumulated to grant a yearly income of $7.91 to the employee, if still alive. Next year at age 19 the company could, if it felt so disposed, make a similar contract promising an annuity of one per cent on that year's salary, and paying the exact cost therefor. The employee being one year older is one year nearer to the time when he would receive the annuity, and the cost to the company would, therefore, be greater than the previous year. While at age 18 the cost is $5.47, at age 23 it is $6.88, at age 28, $8.70; at age 38, $14.16; at age 48, $23.41; at age 58, $41.92. Applied to the 12,972 employees reported by 136 companies, and allowing for the annuities to begin at age 60 for the 657 females, the current year's cost for annuities of $7.91 would be $163,249 or 1.59 per cent of the pay roll. Next year the companies could provide for similar annuities, and if they followed this course each year, a number of annuities totaling one per cent of all his yearly salaries would be purchased for each employee. If all of the employees remained with the company the cost would actually increase each year, and five years from date would be $201,980; but they will not all be with the company five years from date, and it is here that the simplicity of the plan appears. Using age 18 as our illustration, the company purchases for each employee at that age an annuity of $791 for $5.47 and if any employee resigns or is dismissed at the end of one year and another employee taken in his place at age 19, the company can allow the $5.47 which it advanced a year ago for the first employee together with its interest addition to be applied to the credit of the second, thus providing for him while incurring but little expense in so doing. In like manner, the value of all allowances forfeited through resignations and dismissals, together with the excess interest earned over and above the 4 per cent assumed in the calculations could be applied, and only the net increase each year would have to be met by the company. What this amount would be is problematical, and could not be estimated from the available data, but the actual cost would be reduced to a minimum, bearing in mind, of course, that as the ages increase it becomes heavier.

This single deposit plan calls for an initial outlay on the basis of average salaries of about 1.59 per cent of the pay roll, while average annual premiums call for 3.54 per cent. In case it is imperative to limit the initial payment to one per cent of the pay roll, the arbitrary rule could be adopted of allowing this amount, and granting the benefits yearly for such sums as it, plus the forfeitures, would provide according to the single deposit schedule. Such a proposition would be extremely simple to carry into operation and at the same time would be in harmony with the service annuities of other companies. For instance, one of the provisions adopted by the International Harvester Company is, "Should the aggregate pension allowances exceed $100,000 in any one year, then unless the Board of Directors increases the yearly amount usable for pensions, a new rate shall be established proportionately reducing all allowances."

It should be clearly understood that as the men who receive the largest salaries are usually the older men, the cost of their annuities will be relatively higher than those for the younger men receiving smaller wages, and it is, therefore, often found advisable to either limit the amount of annuity, or, what is practically the same thing, limit the eligible list to those receiving yearly remunerations not exceeding a certain amount.

LIFE INSURANCE

Mutual Insurance Associations generally spring up in about the same manner as Sick Benefit Associations, with the same motives and with a general plan whereby all members pay the same premium. This was evidently in the minds of the Committee when they "estimated that assisted by the employing company * * * a death benefit of from $300 to $500 can be paid with a weekly premium contribution ranging from ten cents to fifteen cents."

It hardly seems necessary, in view of the explanation given for Health Insurance, to do more than state that a general increase in cost by age is likewise shown in insurance.

To secure $100 payable at death, the annual premium payable throughout life is $1.30 at age 20; $1.70 at age 30; $2.37 at age 40; $3.58 at age 50, and $5.76 at age 60. Applying the premiums given to the 12,972 employees reported by groups, the total premium is $25,806 a year for $100 of insurance; this on the average is practically $2.00 a year per person, or four cents a week, but the inequity of not considering ages has been pointed out.

The death and sickness benefits differ from the service annuities inasmuch as the employees pay for them, and if the charge be made sufficiently large so that no increase need be called for in the future, the result will be more satisfactory, and the question of dismissals and resignations will be largely eliminated, as any accumulations or such parts thereof as it is deemed expedient to give up, can be returned when an employee leaves.

In order to show the necessity of an accumulation, unless premiums are expected to increase in the future, recourse has been made again to the higher ages of the Combined Experience table and the 1319 living at age 90 assumed to be insured for $1 with a premium of .3639. The payment of the premium by the surviving members, the death claims paid and the difference accumulated at interest each year are shown in detail in the following schedule:

SCHEDULE SHOWING SUFFICIENCY OF WHOLE LIFE ANNUAL PREMIUMS

AGE 90—ANNUAL PREMIUM FOR $1000 INSURANCE, $363.89

COMBINED EXPERIENCE 4 PER CENT INTEREST

Yr-	1 Age	2 Number living	3 Fund at commencement of year	4 Premiums pd at commencing of yr	5 Sum of 3 & 4	Col. 5 improved at 4% Int	Claims paid	Fund end of year
1	90	1319	$0,000.	$479.969	$479.969	$499.168	$427,000	$72.168
2	91	892	72,168.	324.588	396.756	412.626	322,000	90.626
3	92	570	90,626.	207.416	298.042	309.964	231,000	78.964
4	93	339	78,964.	123.358	202.322	210.416	155,000	55.416
5	94	184	55,416.	66.955	122.371	127.266	95,000	32.266
6	95	89	32,266.	32.386	64.652	67.238	52,000	15.238
7	96	37	15,238.	13.464	28.702	29.850	24,000	5.850
8	97	13	5,850.	4.731	10.581	11.004	9,000	2.004
9	98	4	2,004.	1.455	3.459	3.598	3,000	.598
10	99	1	598.	.364	.962	1.000	1,000	.000

Were $90,626 not accumulated at the end of the second year or $78,964 at the end of the third year, it is evident that a deficiency would result before the last claim was paid, and a clear understanding of this principle enables us to realize that, not only must the premiums exceed the claims during the early years, but they must exceed them by enough of a margin to permit the accumulation of $90,626 at the end of the second year, $78,964 at the end of the third year, etc. This accumulation is a reserve liability and in no sense a surplus, although sometimes called such by the uninitiated.

Under the assessment plan of insurance the 1319 members at age 90 would each pay $311.28, making a total of $410,578 and this amount improved at interest for one year is $427,000. As 427 die, there is $1,000 available for each beneficiary and the need of a $363.89 premium is questioned, before it is realized that at age 91 the 892 members would be compelled to pay $347.10, in order to provide for the 322 deaths due that year.

The fundamental proposition here brought out is the wisdom of collecting large enough premiums at the start to obviate the necessity for an increase in future years. The following rates, on a weekly basis for $1,000 of insurance for ages 20-65 payable throughout life are suggested as the minimum which will accomplish this result:

WEEKLY PREMIUM FOR INSURANCE OF $1000

Payable at Death Premiums Payable for Life

Age	Premium	Age	Premium	Age	Premium	Age	Premium
20	$ .25	31	$ .34	42	$ .50	53	$ .79
21	.26	32	.35	43	.52	54	.83
22	.27	33	.36	44	.54	55	.87
23	.27	34	.37	45	.56	56	.91
24	.28	35	.38	46	.59	57	.96
25	.29	36	.40	47	.61	58	1.01
26	.30	37	.41	48	.64	59	1.06
27	.30	38	.43	49	.66	60	1.11
28	.31	39	.44	50	.69		
29	.32	40	.46	51	.72		
30	.33	41	.48	52	.76		

In view of the fact that it is proposed to grant Service Annuities commencing at ages 60 or 65, it might be wise for the annuitant to have the insurance fully paid for by that time, and accordingly the weekly rates are submitted payable until ages 60 or 65 only, but with the insurance continuing throughout life.

WEEKLY PREMIUMS FOR INSURANCE OF $1000 PAYABLE AT DEATH

Males		Females	
Premiums payable until age 65 only		Premiums payable until age 60 only	
Age	Prem.	Age	Prem.
20	$ .26	20	$ .27
21	.27	21	.28
22	.28	22	.29
23	.29	23	.30
24	.29	24	.30
25	.30	25	.31
26	.31	26	.32
27	.32	27	.33
28	.33	28	.35
29	.34	29	.36
30	.35	30	.37
31	.37	31	.39
32	.38	32	.40
33	.39	33	.42
34	.41	34	.44
35	.42	35	.46
36	.44	36	.48
37	.46	37	.50
38	.48	38	.52
39	.50	39	.55
40	.52	40	.58
41	.55	41	.61
42	.57	42	.65
43	.60	43	.69
44	.64	44	.74
45	.67	45	.79
46	.71	46	.85
47	.75	47	.91
48	.80	48	.99
49	.86	49	1.08
50	.92	50	1.19
51	.98	51	1.32
52	1.06	52	1.48
53	1.15	53	1.68
54	1.25	54	1.97
55	1.37	55	2.34
56	1.52	56	2.91
57	1.70	57	3.85
58	1.93	58	5.72
59	2.23	59	11.29
60	2.65		
61	3.28		
62	4.31		
63	6.35		
64	12.46		

If this latter table be adopted, a man after his productive period is past, when sick benefits have ceased, when he is in receipt of a service annuity, may have the satisfaction and contentment incident to the knowledge that the necessities of life will be forthcoming, and that when death does come his burial fund has been provided.

Respectfully submitted, J. D. Craig.

APPENDIX B

DECISION OF THE KANSAS PUBLIC UTILITIES COMMISSION IN REFUSING AN APPLICATION FOR A COMPETITIVE FRANCHISE AT PARSONS, KANSAS

In re Application
F. E. Workman

Docket No. 179

The duty rests upon the applicant to show that public convenience and necessity will be subserved by permitting another utility to enter the same field.

This action was brought by F. E. Workman, of Parsons, Kansas, seeking a certificate of public convenience and necessity authorizing him to build and operate an electric light and power plant in the City of Parsons.

The case was heard by the Commission on January 8, 1912, at which time representatives of the Parsons Railway Company appeared and protested against the Commission granting the proposed certificate on the ground that the present Company is amply able to meet the needs of that community.

Under the provisions of Section 31 of Chapter 238 of the Session Laws of 1911, no common carrier or public utility, governed by the provisions of the act, is permitted to transact business in the State of Kansas, until a certificate has been obtained from the Public Utilities Commission that public convenience will be promoted by the transaction of such business.

The duty rests upon the applicant to show that public convenience and necessity will be subserved by permitting another utility to enter the same field.

Practically the only reasons assigned for permitting another electric light company to engage in business in Parsons were that the Parsons Railway and Light Company had notified the city authorities that after the expiration of its present franchise on July 1, 1912, it would expect a higher scale of rates and that five or six individual plants had been installed by large users of electricity. A number of witnesses, including the Mayor and a Commissioner of the City of Parsons, testified that the service rendered by the present Company is reasonably satisfactory. In fact it was pretty conclusively shown that the plant of the

Parsons Railway and Light Company is adequate for all present and prospective needs of Parsons.

The obvious purpose of the Legislature in enacting Section 31 of Chapter 238 of the Session Laws of 1911, commonly known as the public utilities law, was to prevent a duplication of utilities where one is rendering reasonably satisfactory service. This question was the subject of discussion by the Wisconsin Railroad Commission in the La Crosse Gas and Electric Company case, 2 Wis. R. R. Rep., page 5, when the Commission well said:

"Duplication of such plants is a waste of capital, whenever the service can be adequately furnished by one plant. It necessarily means that interest and maintenance must be earned on a much greater, if not twice as great an investment, and that the actual cost of operation is likely to be relatively higher. Competition in this service, therefore, usually means a bitter struggle and low rates until one of the contestants is forced out of the field, when the rates are raised to the old level, if not above it; or to a combination or understanding of some sort between them which also ultimately results in higher rates. In this way it often happens that the means which were thought to be preventative of onerous conditions are impotent. In fact, active and continuous competition between the public utility corporations, furnishing the same service to the same locality seems to be out of the question. This has been shown by experience. Such competition is also contrary to the very nature of things. Two distinct and separate corporations are not likely to remain separate very long after it becomes clear that the services rendered by both can be more cheaply and more effectively furnished by only one of them."

The same question was before the Supreme Court of Massachusetts in the case of Weld *vs.* Gas and Electric Light Commissioners, 197 Mass., 556, on appeal from a decision of the Commission. The court said:

"The fundamental principles, relied on by the petitioner as applicable to corporations of this general Commonwealth in regard to gas and electric lighting companies, and the facts of this case give considerations very different from those which induce the decisions in many of the cases above cited. In the first place, in reference to this department of public service, we have adopted in this State legislative regulation and control as our reliance against the evil effects of monopoly, rather than competitive action between two or more corporations, where such competition will greatly increase the aggregate cost of supplying the needs of the public, and perhaps cause other serious inconvenience. Under the R. L. c. 121, Par. 1, 5, 6, 8, 14, 15, 26, 34 and 35 the board of Gas and Electric Light Commissioners are given supervision and control over all companies furnishing gas or electricity to the public for lighting, and, among other things, they may order, under Par. 34, any reduction in the price of gas or electric light, or improvement in the quality thereof. Under Pars. 8 and 9 the courts have jurisdiction to enforce all lawful orders of the board, and all provisions of the law relative to such companies. The State, through the regularly constituted authorities, has taken complete control of these corporations so far as it is necessary to prevent the abuses of monopoly. Our statutes are founded on the assumption that it is not necessary to have two or more competing companies running lines of gas pipe and conduits for electric lines through the same streets from time to time, with the resultant disturbance of pavement, street railway tracks, water pipes and other structures. In reference to some kinds of public service and under some conditions, it is thought by many that regulation by the State is better than competition."

In the application of the Niagara Falls Lighting Company before the Public Service Commission of New York, Second District, in 1908, the Commission said:

"The policy of this Commission in cases where one lighting company seeks to enter a field already occupied by another, requires that the applicant shall show that the company already serving the community is not doing so adequately and efficiently and that its failures are such that they cannot well be corrected by the exercise of the regulative power of the Commission. Good service may now be obtained at reasonable prices in less expensive ways than by unnecessary duplication of plants and the public interest does not demand that capital invested in good faith in the public service should be destroyed or impaired without good reasons to be shown affirmatively."

The whole controversy in Parsons seems to be one over rates. In the opinion of the Commission the present laws give a city of the first class sufficient power to regulate the rates of an electric and power company. Express provision has been made in Section 33 of the public utilities law for an appeal to this commission by either the utility or ten aggrieved taxpayers, in case any right, privilege or franchise granted, or ordinance or resolution or part of any ordinance or resolution adopted by any municipal council or Commission is unreasonable, or against public policy, or detrimental to the best interests of the city, or contrary to law.

From the showing made, it does not appear that public convenience would be promoted by permitting another light and power company to engage in business in Parsons.

It is therefore ordered that the application of F. E. Workman be denied.

Dated at Topeka, Kansas, this
5th day of February, 1912.

By Order of the Commission,

Secretary.

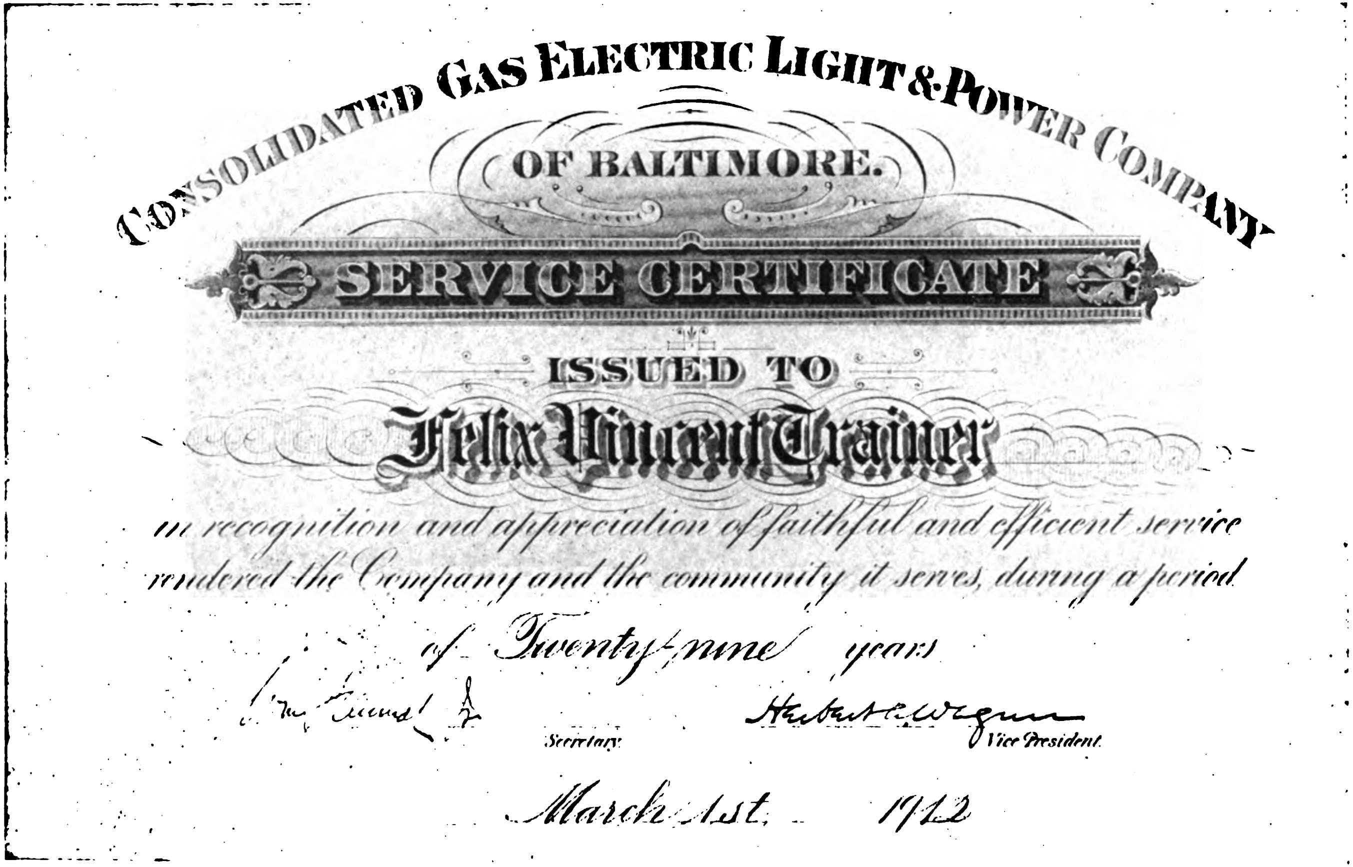
APPENDIX C

COST OF PROVIDING INDUSTRIAL ACCIDENT COMPENSATION TO ITS EMPLOYEES AND TO THE GENERAL PUBLIC BY THE NEW YORK EDISON COMPANY COVERING A PERIOD OF SIX YEARS

Disbursements	1906	1907	1908	1909	1910	1911	Total 6 Years
Disability pay roll.......	$13,055.82	$12,477.83	$11,331.39	$13,267.62	$16,600.67	$15,880.41	$82,113.74
Doctors	7,475.95	8,277.05	9,056.38	11,025.21	12,536.75	16,707.30	65,078.64
Drugs, etc.............	1,765.82	1,023.61	790.82	1,094.62	915.38	1,329.01	6,919.26
Miscellaneous	347.98	270.75	361.25	477.32	4,784.11	5,958.74	12,200.15
Payments to employees who have not accepted Cos. relief system	4,622.06	8,576.96	2,419.30	1,327.99	6,124.50	17,278.70	40,349.51
Payments to outside public	775.00	4,933.00	688.92	2,561.00	853.00	1,921.40	11,732.32
	$28,042.63	$35,559.20	$24,648.06	$29,753.76	$41,814.41	$58,575.56	$218,393.62
Annual pay rolls........	$2,821,040.09	$3,302,283.79	$3,118,101.58	$3,493,399.89	$3,829,952.82	$4,595,881.16	$21,160,659.33
Per cent of cost of pay rolls	$\frac{99}{100\%}$	1.07%	$\frac{79}{100\%}$	$\frac{85}{100\%}$	1.10%	1.27%	1.03%
Per cent of cost exclusive of public.......	$\frac{97}{100\%}$	$\frac{93}{100\%}$	$\frac{77}{100\%}$	$\frac{78}{100\%}$	1.08%	1.23%	$\frac{97}{100\%}$
Number of accidents to employees	751	867	769	880	873	1,412	5,552
Cost per case...........	$36.33	$35.32	$31.15	$30.90	$46.92	$40.10	$37.22

APPENDIX D.

"SERVICE CERTIFICATE" ADOPTED BY THE CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER COMPANY OF BALTIMORE



CONSOLIDATED GAS ELECTRIC LIGHT & POWER COMPANY

OF BALTIMORE.

SERVICE CERTIFICATE

ISSUED TO

Felix Vincent Trainer

in recognition and appreciation of faithful and efficient service rendered the Company and the community it serves, during a period of Twenty-nine years

Secretary.

Herbert A. Wagner
Vice President.

March 1st, 1912

THE CHAIRMAN: We will now have the Report of the Medical Commission on Resuscitation from Electrical Shock, by Mr. W. C. L. Eglin, of Philadelphia, member of the Commission.

Past-President EGLIN then presented the report with introduction.

Mr. Eglin: This question of resuscitation from electrical shock is one that has been before this Association for several years. There were a number of difficulties in bringing this matter to a conclusion. I may say that it was brought to our attention first by Mr. Weaver, of the *Electrical World,* that paper having been responsible for the printing of the chart which is in general use throughout this country. This chart is very well known to us all. It suggests certain methods of inducing artificial respiration. Soon and in various places the accuracy of these methods was questioned, and before issuing a new chart the *Electrical World* took the matter up with our Association. The officers at that time endeavored to get the various medical associations and engineering bodies to combine on some general recommendations as to what should be standard practise in the event of accidental shock by electricity. Because of the very wide application of any standard method of artificial respiration it was considered necessary and thought advisable to notify not only engineering societies and medical associations but some of the government officials, especially as such methods could be applied equally well in the cases of those affected by gas or suffocation from various causes in mines. The whole matter was taken up first at a conference held in New York City, but no final action was obtained because of the difficulty of selecting a competent commission and because of the lack of co-operation between our society and the medical society. I am glad to say that through the persistency of President Gilchrist and Mr. Weaver, we succeeded in getting the American Medical Association to appoint four of the members of that association to consult with us. The chart has now been distributed and if you will read it you will see that the instructions are all very simply stated. But the chart is of no value unless you try the method yourself. In cases of electrical shock time is the most important element and a few seconds may make a difference between life and death, so that it would be entirely too late to read the chart and practise the method after the accident has happened.

When this subject was first presented to the Commission on Resuscitation there were all kinds of methods suggested, and the first question considered by us was that of selection, the elimination of various methods, no matter how good, to secure one which combined efficiency, simplicity and ease of operation. That has been done.

The next question, one now being considered by the committee, is the application of so-called mechanical methods. That is now in the hands of a sub-committee of the medical members of the commission and they are not ready to report at this time.

What actually takes place in shock and what causes death are not clearly known at this time, as they vary in different cases, depending upon how much shock is received. There is one point, however, which is very definitely known, and the medical members are now continuing a series of experiments to ascertain whether they cannot stimulate or restore heart action after it has been stopped by an electrical shock. Not very much hope of success is held out, but we must not say yet that this cannot be accomplished.

I have the report of Doctor W. B. Cannon, Chairman of the commission, which is very brief, and with your permission I will close my report by reading it.

REPORT OF COMMITTEE ON RESUSCITATION FROM ELECTRICAL SHOCK

"The electric current may kill by either temporarily paralyzing the nervous control of the muscles of respiration or by stopping the regular beat of the heart. When the heart is seriously affected it ceases to contract as a whole but continues to contract in parts, here and there, so that it appears to quiver. It is then said to 'fibrillate.' In this condition the heart fails to keep the blood circulating and death quickly results. At present no practical procedure has been discovered which will restore the regular beat of the heart in man after it begins to fibrillate. The chief hope of resuscitation lies for the present in the proper treatment of the cases of paralyzed respiration, and the immediate necessity in these cases is promptness in applying artificial respiration and continuance of the process until natural breathing returns. In some instances, however, the heart may be merely weakened without being made to fibrillate; then again artificial respiration may be of vital importance, because a greatly weakened heart leads to impairment or total stoppage of respiration, which in turn destroys the last vestige of the heart-beat.

In all cases, therefore, an attempt should be made to restore natural breathing.

"Fortunately, artificial respiration can be applied by laymen without the need of complicated apparatus. The older rules for artificial respiration, which have been widely posted in this country, described the Silvester method, a method which directs that the victim of the accident be laid on his back and his chest expanded and compressed by drawing his arms forward and then pushing them back against his ribs. After these rules were published a new method of artificial respiration was devised by Professor E. A. Schafer, of Edinburgh, called by him the 'prone-pressure method.' This consists in laying the victim on his abdomen and applying pressure rhythmically on the loins and lowest ribs.

"Since there was some difference of opinion regarding the relative merits of these two methods of artificial respiration, and since the time seemed ripe for a revision of the old rules and for a possible standardization of new rules for resuscitation, President Gilchrist, of the National Electric Light Association, requested that the American Medical Association and the American Institute of Electrical Engineers co-operate with his own association in this undertaking. Through the appointment of representatives of these associations a Commission on Resuscitation from Electric Shock was organized with the following membership: Dr. W. B. Cannon, Chairman, professor of physiology, Harvard University; Dr. George W. Crile, professor of surgery, Western Reserve University; Dr. Yandell Henderson, professor of physiology, Yale University, and Dr. S. J. Meltzer, head of the department of physiology and pharmacology in the Rockefeller Institute of Medical Research—the four from the American Medical Association; Dr. E. A. Spitzka, director and professor of general anatomy, Daniel Baugh Institute of Anatomy, Jefferson Medical College, and Mr. W. C. L. Eglin, past-president of the National Electric Light Association—named as representatives of the National Electric Light Association; Dr. A. E. Kennelly, professor of electrical engineering, Harvard University, and Dr. Elihu Thomson, electrician, General Electric Company—nominated by the American Institute of Electrical Engineers. Mr. W. D. Weaver, editor of the *Electrical World*, was elected secretary by the other members of the commission.

"The commission was confronted with three problems: (1) The determination of the best method of artificial respiration that can be instantly applied by laymen, and the clear description of that method; (2) a consideration of special mechanical devices for continuing artificial respiration, and the possible invention of a simple and effective arrangement, the action of which might be quickly and easily learned; (3) an investigation of the possibilities of restoring the fibrillating heart to its natural pulsation.

"The third of these problems has hardly been touched, and possibly because of the quick disintegration of the brain in the absence of proper blood supply, a solution may be impracticable.

"With regard to the first problem, that of deciding upon the best method of artificial respiration, the commission voted unanimously in favor of the Schafer, or prone-pressure method. The advantages of this method over the Silvester are greater simplicity and ease of performance, larger ventilation of the lungs (especially when the subject's arms are drawn forward), absence of trouble from the tongue falling back and blocking the air passages, and little danger of injuring the liver or breaking ribs if proper care is exercised. The accompanying chart to be posted in stations, and the pocket-book to be issued to and carried by linemen, describe the procedure which must be followed in giving artificial respiration by the prone-pressure method. The description has been made as concise and clear as possible. A manual procedure, however, is not well learned by reading about it; practise is required for its skillful performance. These rules, therefore, should be carefully practised on a volunteer subject by linemen and all men in central stations, in order that the procedure shall be thoroughly understood.

"With reference to mechanical devices for continuing artificial respiration, a sub-committee of the commission has examined two such devices now on the market and will report conclusions with regard to them later. The desirability of an apparatus which will produce thorough ventilation of the lungs arises from the possibility that even the best method of manual ventilation of the lungs may not be thoroughly satisfactory. The chairman of the sub-committee on mechanical devices, Dr. S. J. Meltzer, has invented a very simple means of securing abundant ventilation of the lungs in such animals as the dog and cat. The apparatus has not yet been tested on human beings, but it probably will be so tested in a short time and may prove an important adjunct to the prone-pressure method as described by the commission."

Respectfully submitted,

Committee
DR. W. B. CANNON, *Chairman*
DR. GEORGE W. CRILE
DR. YANDEL L. HENDERSON
DR. S. J. MELTZER
DR. E. A. SPITZKA
W. C. L. EGLIN
DR. A. E. KENNELLY
DR. ELIHU THOMSON
W. D. WEAVER, *Secretary*

Mr. Eglin then gave a practical demonstration on the platform with one of the members.

MR. HENRY L. DOHERTY, New York City: The medical members of this committee have contributed their services at our request and it is only proper that we should take some suitable action to show our appreciation of the work they have done and I would like to make a motion that we give and convey to the American Medical Association a vote of thanks and appreciation. Mr. Eglin wishes to continue this work, and I move also that the work be continued, and I move, further, that the Executive Committee be asked to finance this work.

The motion is, first, that we extend to the American Medical Association a hearty vote of thanks for the co-operation they have given us in this work, and, second, that this work be continued and that we recommend to the Executive Committee that it be properly financed.

The motion was regularly seconded and carried.

THE CHAIRMAN: The last number on our program to-night is a lecture by Mr. David B. Rushmore, of Schenectady, New York, on the Electrification of the Panama Canal, illustrated by lantern slides.

(The lecture was a most interesting description of the Canal itself, prefaced by some historical data, and went very fully into the details of the methods and apparatus by which electricity has been used very largely in the construction of the Canal for lighting and power purposes; also to the motors for operating the locks, the electric locomotives for hauling vessels through parts of the Canal, and other features. The lecture was accompanied by a large number of interesting views, diagrams, curves, etc., and was heard with much pleasure by the large audience. A vote of thanks was accorded Mr. Rushmore at its close.)

(Adjourned.)

COMPANY SECTION SESSION

THURSDAY AFTERNOON, JUNE 13.

THE VICE-CHAIRMAN, Mr. J. F. Becker, New York City: It gives me great pleasure to call this Company Session to order, and to announce that the first number on the program is the report of the Committee on the Award of the Doherty Gold Medal, by Mr. W. W. Freeman, the chairman of this session.

MR. FREEMAN: There is at least one advantage in a small meeting: It saves the speaker the excessive nervousness that might otherwise result from a large audience. [Laughter and applause.]

The committee on the award of the Doherty gold medal has had considerable work to perform in the reading of the papers. It was guided in determining the award by the fact that not only the character of the paper itself but the value of the paper to the industry as a whole should be considered. There were eighteen papers submitted to the committee, and it is but fair to say that the committee arrived at its conclusion with some difficulty. It was not at all clear to the members individually after reading the papers which was entitled to the award; and the committee felt when it had reached its conclusion, that there were at least three of the papers of such importance and value to the industry that they should be particularly referred to in the announcement of the award.

The medal has been awarded to Mr. C. Nesbit Duffy, of Milwaukee, Wisconsin, for his paper entitled "Electric Utilities"; and the other two papers, to which the committee desires to call particular attention, are those presented by Mr. Charles G. Russell, of Philadelphia, on "Corporations," and Mr. Egbert Douglas, also of Milwaukee, on the subject "The Commercial Development of the Central Station Business." Mr. Russell, by the way, was the winner of the medal of last year.

In making this announcement, I must say that neither the medal, nor the winner of the medal, is here. Mr. Doherty authorizes me to state that the medal has been prepared, but by some delay is in Denver. The inscription will be speedily engraved and the prize sent to the winner, Mr. Duffy.

I also take pleasure in stating, at the request of Mr. Doherty, that the medal will be offered again for this year. This will be all that is necessary to afford the incentive desired. The committee, in view of the fact that the medal was awarded at last year's convention for papers that were presented at Company Sections up to the end of the year, 1910, thought it advisable to limit the award this year to papers presented prior to the end of December, 1911; so that any papers which have been presented to the company branches during this entire calendar year, 1912, and up to the end of the year, will be eligible for the Doherty medal award of next year. We think that covers the matter very clearly.

We will now continue the program and listen to a paper on the training of central station employees, by Mr. H. E. Grant, of Vancouver, B. C., now of San Francisco, Cal.

EDUCATING CENTRAL-STATION EMPLOYEES

SOME NOTES AND RECOMMENDATIONS

The question of educating central-station employees opens up an inquiry illimitable.

To the layman it suggests technical education useful only to employees engaged in particular pursuits. This reference is made advisedly, for, because of the rapid progress of the art and the remarkable expansion of the industry, a large percentage of central-station employees both new and old are, after all, but laymen.

We wish it understood at the outset that this paper is not so limited, but is intended to open up the question of how best to develop the latent talent of all central-station employees, no matter in what department or class of work they may be engaged, so that their work may be accomplished easily yet thoroughly and most profitably to themselves and others.

Our women workers must also be included. There is an old German saying to the effect that a wardrobe is the only library for a woman. In this Association we have a very much greater appreciation of women's efforts. They work side by side with us and command equal consideration.

Everywhere there is an awakening. Employers realize that he who is best educated is the most useful. In the light of the new science of business-building based upon the proposition that he profits most who serves best, both are benefited, and the customer or patron no less than either. It is useless, however, for this Association to plan an educational scheme, more or less comprehensive, unless the thought is aroused and encouraged in each individual employee, "How best can I develop my latent talent, that it be used to the greatest advantage of myself and others?" The idea is expressed perhaps more forcibly in that old adage, "You may lead a horse to water, but cannot make it drink." We believe, however, that the central-station employees' desire for knowledge already exists. The question is, how best to satisfy it. Even if for selfish reasons only, employees should be eager to consider this question and to do their part in effecting its satisfactory solution. It is far more difficult for them to execute a task about which they know little or nothing. Great joy, too, comes from increased usefulness. Elbert Hubbard says truly, "Responsibilities gravitate to the man who can shoulder them; power flows to the man who knows how." It is easy for the interested man to attain, but attainment is beyond the reach of indifference or ignorance.

Every normal employee, however, wishes to advance. In order to advance he must have the ability to do. The ability to do should therefore be sufficient incentive, for "Knowest thou when Fate thy measure takes, or when she'll say to thee, 'I find you worthy, do this thing for me?' "

What to do? Is there any existing course of studies which covers our requirements sufficiently well? An exact statement of central-station service has yet to be made. A course of study upon so important a subject could not be compiled by a mere student, and is it not advisable that we, as an Association, plan a practical scheme for the educating of central-station employees which will prove satisfactory?

Any study of central-station service must deal with the perfecting of men, materials, methods and machinery. It must show the essentials of success outside of mental ability, the need of harmonious co-operation, of earnestness, loyalty and enthusiasm in carrying out an approved public policy. No intelligent employee can give service or do work of any kind without himself gaining knowledge. Most of us acknowledge freely our indebtedness to the many excellent trade periodicals which contribute to the general fund of knowledge. We realize too that the annual conventions of our Association result in the publication of information indispensable in keeping pace with the progress of the industry. From these sources and many others we endeavor to obtain that knowledge necessary for the giving of good service, but much of this reading proves to be unprofitable and at times it is impossible to get just the information which we need, or to understand what we do read. System is lacking.

It should be possible for any employee to obtain just the information he requires and at the time he needs it. It should be the purpose of the proposed course of study to anticipate the requirements of each so that the service rendered shall be spontaneous and easy to get at. A well-trained employee will intuitively do the right thing at the right time. The results from logical, sound training should be just as satisfactory as those obtained through the perfection of materials, of methods and of machinery. Heretofore the greater amount of time and money has been expended upon the last three. It is time we gave more attention to the perfecting of men. It is sometimes thought that low operating cost is dependent upon cheap labor. In the central-station industry at least this does not hold good.

Most of our accountant members know what a reaction has set in against the employment of unskilled labor in billing work. This is now the work of properly qualified accountants, and the change has resulted not only in lowering the cost of billing, but in reducing errors and customers' complaints. Is there any valid reason why a high standard of efficiency should not be obtained in all the other departments of central-station service and with equally gratifying results?

Because of the rapid growth of our industry, both general and special instruction are needed by the men. There is now no difficulty in finding positions for efficient employees; they will always be in demand, and must necessarily be developed. If you tickle the ground it will not laugh a harvest, and so we find governments teaching the science of agriculture, knowing that national wealth and prosperity depend upon the individual efforts of the farmer. In countries where the farming is diversified, the instruction also varies.

Central-station companies have improved their machinery and their business methods; why should they be satisfied with under-trained men?

Because at the end of their initial effort "failure" seemed to be writ large, some concerns have discontinued their education work altogether and have lost interest. That interest must be aroused again. Properly planned and prosecuted educational effort should prove profitable alike to employer and employee. The fault certainly does not lie with the education. Failures have occurred and will occur again until the experimental stage has been passed and the unsuccessful or unnecessary issues have been cut out, but the cost of these necessary experiments in lesson-giving are as nothing compared with the losses due to inefficiency and ignorance. Let us change the plan. Efficient supervision plays an important part in the educating of central-station employees. Supervision is not arbitrary bossing and distrust; it consists in encouragement, guidance and instruction. and because it naturally leads, it commands respect. "You who have been among the hills," wrote Ruskin, "know how the bad guide chatters and gesticulates, and it is 'put your foot here,' and 'mind how you balance yourself there;' but the good guide walks on quietly, without a word, with his eye on you only when need is, and his arm like an iron bar if need be." Employees as a class undoubtedly wish to do what is right. Failure may be caused by poor leadership as well as by lack of instruction.

Get their interest, tell them what to do; show them how; let them feel that it must be done, and they will do it. They will do still better if someone goes a step further and tells them why it has to be done. The words of the ancient writer were well chosen. The work-ox and the ass are too often found laboring under the same yoke. Neither has a fair chance nor just dues. Separate them.

Much should be made of the daily, weekly or other periodic experience meetings where those working in the same department state just what they have accomplished worthy of note. The head of the department should invariably be present, counseling, advising and encouraging. The proper education of employees will reduce the need of supervision somewhat, but it should be borne in mind that it is human to err and if a staff is to be developed to the highest point of efficiency careful supervision will always be essential.

There are some who do not agree with the idea that the educating of employees should be on technical lines only and the instruction actually given where the school experiment is being tried is not so limited. The New York Edison Company is prosecuting a very comprehensive Sales Department course which is proving entirely successful. This company has also given special instruction upon technical subjects for some years past, and now has under consideration the inauguration of a distinct course for accountants.

Two years ago the British Columbia Electric Railway Company, of Vancouver, British Columbia, carried on a haphazard but very successful commercial course, the object of which was to increase the efficiency of the staff of the Light and Power (Contract and Sales) Department. It has also been giving technical education for the past seven years, and although it does not manage the school, it is providing quarters, experimental apparatus, and other supplies and contributing very generously toward defraying the cost of lectures and other expenses. Many other companies give special instruction to employees upon technical subjects.

Other information is given in the Appendix regarding the courses of the New York Edison Company school before mentioned, and you are also referred to the *Proceedings* of the Association, 1910, Vol. II, p. 497.

Reference should also be made to the many comprehensive text-books, easy to read, but often representing magnificent and tireless work on the part of writers and compilers.

There seem, after all is said, to be many sources from which the knowledge necessary to the central-station employee may be gathered. Much could be accomplished by the aid of studies planned for each class of employee, officials or special instructors helping the student employee with the most difficult problems. Give each man a chart. Examinations, both oral and written, should be included, and the bibliography of each subject carefully compiled. The books and articles so chosen should be read studiously. In order to keep pace with improvements, special or general, in central-station service—which be it remembered covers all branches of the work—current articles or new works useful to the different classes of employees should be brought to their attention through the medium of the local Bulletin.

Special attention should be directed to that splendid vehicle for the dissemination of both general and special information, the company Bulletin. There is no company so small that it can not support its own Bulletin. It is not necessary that it be pretentious, and if thought advisable, it can be made self-supporting. In any event, to use a catch phrase of the advertising man, "it pays for itself."

It is unnecessary to do more than refer to the educational value of the Company Section and the additional worth of the proposed special lectures to be given in connection with it by those occupying prominent positions in the development of the central-station industry.

It is not too much to say that a plan of presenting diplomas could be profitably adopted by the parent Association. Real merit should be associated with their possession, in which event they would prove invaluable to employer and employee. The method of award is a matter for more mature consideration.

The plan proposed is not new. It has already been suggested in that excellent paper on Private Policy, presented by Mr. Paul Lüpke at the Atlantic City Convention, 1909. The Illuminating Engineering Society in its splendid course of lectures given at the Johns Hopkins University last year has given us a model for at least one phase of our work upon which we could probably with profit build the rest. This is not the time to go into detail. The plan proposed by our Association for educating central-station employees should not be the work of one individual, but should be built up by a committee after due consideration has been given to the opinions and requirements of all interests.

APPENDIX

The Organization

An organization has been perfected for the commercial school work with the following executive staff: F. C. Henderschott, of the Bureau of Unused Meters, manager; E. G. Grandstaff, instructor in charge; Miss Gertrude S. Waters, secretary.

Offices

The headquarters of the school will be at 424 Broadway; school sessions will be held in the Edison Auditorium, 44 West Twenty-seventh Street.

Preliminary Work

In completing the organization for the school, under an order from Mr. Williams, each male employee of the department who has not visited the Waterside central stations and at least one substation will be required to do so. Mr. Grandstaff has this work in charge.

In connection with the school a complete record of each employee will be compiled, the object being to bring the employees into closer relationship with the head of the department. This work will be in charge of Miss Waters, who will call upon and consult with heads of the different bureaus in the department.

The Field and Our Position in It

Those charged with the duties pertaining to the operation of the school fully realize the task which has been assigned to them. They have entered into the work with full determination to make the proposed school worthy of the company of which it is a part. Everything that conscientious effort and earnestness can accomplish will be done, but it is realized that in large measure the success of the school will rest upon the co-operation and assistance furnished not only by the heads of bureaus, but by every member of the department. This co-operation and assistance is earnestly requested.

Suggestions Invited

The general inspector has directed that boxes be placed in each of the district offices, the Auditorium, and also on the 7th floor of 55 Duane Street, in which suggestions may be deposited. Such suggestions will have careful consideration.

Pioneer Work

This school is the first of its kind to be inaugurated in electrical operating corporations. Other lines of industry, however, have maintained or are establishing similar educational work. Those in charge of the school hope to make it a model for the industry.

Ambition

Such a position would not only be in keeping with the ambitions and policies of the New York Edison Company, but would be its rightful position and a source of pride to every member of the organization.

Following is a synopsis of courses to be given:

COURSE I—The Elements of Central-Station Business-Getting.

COURSE II—Hygiene, Health and Recreation—Elements of Psychology.

COURSE III—Basic Principles of Salesmanship and Their Relation to Business Building.

COURSE IV—Scope, Policies and Organization of the New York Edison Company.

COURSE I

Elements of Central-Station Business-Getting

Instruction based on the Company Solicitor's Handbook and the National Electric Light Association Solicitor's Handbook.

Inspection tours to the Waterside central stations and typical substations, followed by lectures and discussions on the fundamental principles of electricity—central and substation equipment, transmission systems.

Inspection tours to the meter-testing laboratories, followed by a lecture by Mr. F. V. Magalhaes on the principles and construction of watt meters and meter-setting.

The next school session following each lecture will be devoted to oral and written examinations. This work will be given by the instructor in charge.

The class will include those employees who are preparing for positions as inspectors, agents and solicitors, and those inspectors, agents and solicitors who are in need of such instruction.

The class will be divided into several sections, each meeting on a different day but receiving the same instruction. This arrangement will least interfere with the routine work of the company and will also afford better opportunity for individual instruction and will make the work more effective.

School sessions for this course will be held on Mondays, Wednesdays and Fridays from 4.00 to 5.30 p. m.

COURSE II

Hygiene, Health and Recreation, and Elements of Psychology

Lectures on these and kindred subjects, followed by discussions. The school session following each lecture will be devoted to an oral and written examination. These lectures will be delivered by the company doctor and other authorities, if found desirable.

Examinations will be given under the direction of the instructor in charge.

The class will include all who are enrolled in the school, and any other employees who can be spared from their duties. Only those, however, who are enrolled in the school will be expected to take the examinations.

These lectures will be given on Thursdays from 4.00 to 5.30, in conjunction with Course I.

COURSE III

Basic Principles of Salesmanship and Their Relation to Business Building

A series of lectures on the above subjects will be delivered by the manager of the school and by men of known authority on these subjects. Lectures will be followed by discussion and sales demonstrations.

The next school session following the lecture will be devoted to oral and written examinations under the direction of the instructor in charge.

The class will consist of those employees who are preparing for positions as inspectors, agents and solicitors and those who are now filling such positions and are in need of such instruction.

The school session will be held on Thursdays from 4.00 to 5.30 p. m., in conjunction with Course I after Course II has been completed.

COURSE IV

Scope, Policies and Organization of the New York Edison Company

PART I

Lectures on:

1—"The Organization and Scope of the Contract and Inspection Department," by A. A. Pope.

2—"Contracts," by the Company Attorney.

3—"Relation of Auditor to Contracts and Credits," by J. C. Van Duyne.

4—"The Company's Method of Handling Complaints," by W. R. Boyd and R. Humphries.

PART II

Lectures on:

1—"Commercial Engineering," by E. F. Tweedy.

2—"Duties of the Power Engineer," by C. K. Nichols.

3—"Illuminating Engineering," by C. L. Law.

4—"Central-Station Service—Its Advantages Over Isolated Plants," by M. F. McAlpin.

5—"The Field of Electric Vehicles," by H. Robinson.

6—"Installations by Instalment," by E. A. Mills.

Address by Mr. Arthur Williams on the scope and policies of the New York Edison Company.

All the students enrolled in the school and any other employees who can be spared from their duties must attend these lectures.

The school session following each lecture will be devoted to oral and written examinations conducted by the instructor in charge.

The lectures will be given on Thursdays from 4.00 to 5.30 p. m., in conjunction with Course I after Courses II and III have been completed.

Records

The records of the school will consist of complete information regarding the education and experience which each student has had prior to his engagement with the Edison Company. Also a record of his progress since coming with the company. His personal appearance and characteristics will be noted and be a part of these records. His scholarship and progress in the school will be carefully kept.

Reports

Reports of the progress of the school will be made to the general inspector. Managers of district offices and heads of bureaus will be advised of any delinquency on the part of employees under their direction and each delinquent will be given special instruction when necessary.

Awards

A certificate will be awarded to those who complete the course with credit. Prizes for excellence in scholarship will be given.

DISCUSSION.

MR. T. F. BLUDWORTHY, New York City: I would like to discuss this paper from the point of the adaptability of the man to his business. Man grows and develops only in an employment or in an industry to which he is naturally best adapted. Now, these helping institutions which have been under discussion, attempt to select the occupation to which a man is best adapted and to point it out to him and also to fix his permanent employment. Men are naturally divided, according to vocation and the application all around the vocation itself. By reason of different organizations it becomes necessary for a man to go further than to say he is simply an electrical engineer. The duties of an electrical engineer or a salesman vary in different organizations; that is to say, a man may be very successful in one particular institution, and be wholly unadapted to another, even though in the same industry. Thus it becomes necessary for all our institutions to take their men and attempt to train them.

MR. C. N. STANNARD, Denver, Colo.: I was some months ago appointed chairman of an educational committee with instructions to ascertain what is being done in the country in that line, and to make certain recommendations for educational work. I have interviewed various educational authorities, and corresponded with a great many companies, and I have been surprised to find how little is done for the benefit of the employees connected with large corporations. In some instances, a little work, unsystematic and not broadly conducted, is carried on, but this is all.

I corresponded with Mr. Arthur Williams of The New York Edison Company, and by invitation watched a very elaborate scheme in successful operation. I learned also that some companies were doing an admirable thing; they were paying the tuition fees of such employees as cared to take up educational work. I found one instance of a corporation which was allowing its employees every other afternoon off that they might attend a technical trade school, the men going in relays. A number of interesting facts were collected, but, as I said before, with these few exceptions, there was nothing of the character that I had expected to find. However, from information received, I think it is quite feasible for large corporations to inaugurate educational features and give their employees an opportunity to fit themselves for better positions, which means ultimately more salary, the thing in which the majority of men are most vitally interested. I am a believer in employing educated men, and we endeavor to get this class of men although we are not in a position to refuse a man who has ability because he has not had technical or college training. I hold that a man having a college education but not able to apply his technical knowledge, or the man lacking industrious habits, is not as good an employee as the man who has native ability and is industrious; in other words, I believe the man with higher education is a good man if he has the ability to apply what he has learned and is industrious in that application.

MR. V. L. BOARD, Denver, Colo.: I have always believed that a great deal can be done in the educating of employees in a practical way. While I want it understood that I am not in favor of class instruction and all that sort of thing, I believe that as far as the men working for a company are concerned, much might be done to better qualify them for the particular lines of work they are doing. One method that appeals to me and which certainly brings about considerable co-operation in some companies is the shifting of men from one department to another, until they get a comprehensive idea of the entire business. A great many men in particular departments are not doing their work as well as they might or as well as they would like to do it, on account of not being familiar with the work of other departments.

Now, I have been connected with some companies where when a new man is taken on, he is shifted from one department to another closely related to it until he gets a thorough knowledge of both. When taken back to the department in which he started, he is much better able to carry the work through.

It might be of interest to you to know something of the system carried out by the Denver Gas and Electric Company in regard to the employing of technical men. That company, as you know, is one of the Doherty organizations, and has for the past five or six years taken on a number of technical men each year. Those men are hired under a contract for two years; and during the two years they are shifted from one department of the company to another, and get a thorough practical knowledge of the central station business. The idea of the school is simply to train men, technical men, in a practical way for the central station work of the various companies of the Doherty organization. While it is so called, it is not really a school, but it gives good practical results which have been very satisfactory.

Another instance of the education of employees is the rather elaborate system of the Telluride Power Company. This is carried on largely, as I understand it, as a private philanthropy of the president and general manager of the company, Mr. L. L. Nunn. This company established what it termed the Telluride Institute at Homestead, Utah, one of the stations of the company, a number of years ago. Very competent teachers were employed by the Institute for the purpose of giving instruction to the employees, and any man who showed ability or an inclination to study while working for the company was housed and boarded by the company, a certain stipulated portion of his salary being deducted for this. These men, when they showed marked ability, were given what is called a residence scholarship, under which they attended the Institute but did no work for the company, as they were just getting simple primary education. When they fininshed the work of the Institute they were usually given a scholarship in some college or university in the United States.

It was a very elaborate system, requiring private means, and is not now carried out in quite the original way. The whole thing has been moved to Cornell University. It would be interesting to know why and what has been gained by so doing.

MR. JOHN G. LEARNED, Chicago: In the last analysis every one seems to favor some mental training for an employee. However, I think that in the general uplift physical education should not be overlooked, as primarily the physical is the foundation for the furtherance of the mental. Consequently I think those companies which are taking up the Y. M. C. A. work for their employees are doing a very excellent thing, as it discourages mere bookworm employees. We are at the present time offering to aid or to pay half the dues of any of our men who will avail themselves of the opportunity to become members of the Y. M. C. A. at various points in our territory.

MR. R. B. MATEER, Denver, Colo.: I do not at all favor the tendency to make bookworms of the men. I think a great deal of the education that will uplift a man is practical, simple practical demonstrations, such as he may obtain by placing him in different departments and arranging to have him become familiar with the various lines of work carried on simultaneously in any company. In addition to this, I also strongly favor evening sessions wherever possible, and the grouping of those attending in what might be called class rooms, where each division will receive that which is most needed by it. For instance, a group of men decidedly interested in becoming skilled accountants should not have to listen to a talk on exterior illumination or rural and suburban lighting. Separate these men for the time being, and taking those who are more or less familiar with special subjects, spend an evening in lecturing on these and follow the lecture by a partial examination, to fix it. If later on you need to give them a general talk, call them together for one evening each month. I think you would get better results from this simple, practical method than from an elaborate course of study which would require of the men from two to four hours of reading every night in the week.

MR. JOSEPH B. SEAMAN, Philadelphia: It would seem to me it might be well for us to have a committee on this subject in our organization, so that those of us who are not so fortunate as to be in touch with the larger institutions of learning, could none the less draw upon these sources of information for the education of our employees. The employee who does not spend of his means in an earnest effort to constantly advance his working knowledge more or less is an undesirable employee. Our great industry, with its diversified duties, requires that a man study in order to master the details of any duty of any character. A great demand exists, it seems to me, that our employees study our business as a whole, this great industry we have the privilege of serving, and this is true, whether he be young, strong and ambitious to advance and become a leader, or whether he wishes only to become a skillful helper. There are a great many positions vacant because men cannot be found to fill them, and if we can inspire our employees to study not only the details of their own work, but the broad scheme of the business as a whole, we shall have done a great work.

In 1902 when, in Philadelphia, we started a system of examinations for the advancement of meter testers, we compiled several hundred questions and distributed these among the men. On certain dates examinations were given, and by those examinations we certified as "passed" the men who were within the schedule, and they were advanced. We also circulated the employees through the different departments of the business before permitting them to settle to certain duties.

In concluding, I might say that as a general proposition it appears to me better to take the average employee or working man and train and educate him than to employ untrained educated men. To educate men already employed is essential, at least in some branches of our business.

MR. C. A. GRAVES, Brooklyn, N. Y.: I was surprised in talking with the professor of an institution which is maintained for central station employees to hear him say that the average central station man aims too high for his class, and that he does not learn to use his mind. I asked him for an explanation, and he said that most of the men who came to his class were perfectly willing to have him lecture to them, they were willing to do some experiments with the laboratory apparatus, but when it came to putting their knowledge on paper, when it came to an examination, they almost invariably fell down. He suggested that the thing to do was to have employees start on simple elementary practise rather than aim for the larger and more specialized problems.

Mr. Bludworthy: If I may be allowed to speak again on the subject, I would like to say a few words about the plans of the New York Edison Company. I realize that they are not fully understood. One of the speakers has suggested that each employee be put through the various departments in our organizations. I personally do not approve of that plan because I think it is altogether unnecessary for a salesman to be a good collecter, and I am well convinced that a good collector never makes a good salesman. The New York Edison Company has a very comprehensive system. We take men there—we employ the best we can get in our organization—and permit them to go to the company school on company time, from 4 o'clock to 5:30. The instruction is given by lectures. The men take notes and are then required to answer certain questions in writing. The head of each department or somebody representing him lectures upon the duties of the department, and the method by which those duties are carried out. That gives a comprehensive enough idea of the whole system, and of the organization of the whole plant. As to the physical side, it is practically impossible for any organization to lay down certain rules and certain exercises which the men must take, but our company promotes the organization of athletic associations and the like, and lectures are constantly being given along that line.

Mr. W. H. Gardiner, New York City: Considering this work of the education of employees, I think we can gain something by our discussion if we give the proper definitions, and distinguish very carefully between instruction and education. It seems to me we have been talking of instruction, practical instruction, when the real thing, which is more important than instruction in detail, is the education of the man as a man, teaching him to think straight, live straight and act straight. If our education of him covers that comprehensively, I think our instruction of him in the various departments, in the various lines of central station work, will be very much easier. We understand the business in which we are engaged, its purpose, its function. Let us ask ourselves what the purposes in life of employees and officers as human beings are, and try to show them where and how they can most thoroughly benefit themselves through their work for employers and the public, incidentally instructing them in the details, and in the technical and commercial methods of business. We shall accomplish more because we shall be working from fundamental conditions upward.

I would like very much to see a committee appointed which would consider in detail, not only methods of school education and class instruction of employees, but the entire question of how to develop the best men, and make the best characters the most forcible broad active workers in the central station business. I do not know whether it would be trespassing upon the activities of the Public Policy Committee, but if it be appropriate, I move to recommend to the Executive Committee the appointment of a committee on the education and instruction of employees in central stations.

The motion was seconded and carried unanimously.

MR. ARTHUR WILLIAMS, New York City: It seems to me we must distinguish between the instruction and the education of our employees; between the purpose for which this instruction is given, or this specialized education is desired. I have in my mind a young man who goes to school or college for the purpose of rounding out his education, as far as he gets one. Then I have in mind the young man who, perhaps not given the opportunity to secure an education through school or college, applies himself to the study of the requirements of the situation, the result of all of which is eventually an education by methods which are additional to his daily effort to secure a livelihood. In that connection, let me say that there is no industry in the world doing as much to help young men and women to become better educated, broadly and technically, as this industry, the members of this industry and this Association. It is an extraordinary liberality, extraordinary and surprising; a few years ago we would have thought this sort of thing impossible. I find the influence of this Association in that direction has been most marked.

Then we must, in still another class, consider the man who comes to us with the training he himself has been able to acquire with such natural gifts as the Almighty has given him. A man's education is the product of three things: hereditary tendencies, environment and training. Those are the three factors which go to make up the complete individual as he comes to us to-day. Now, practical training can be secured by working in the shop, in the station or on the lines. There is no question that the best kind of practical training a man can get is that derived from doing a job under the man who has himself done the thing. His natural and proper ambition to do the work a little better than some one else has done it is a constant spur. There are always, in every class, a certain percentage of men who wish to climb higher, and who use all the means within their horizon to climb with. Now, this new movement, and it is a new movement, this giving men what is called commercial training, is intended, I was going to say, selfishly. No educational process, however, can be selfish. You place the means to acquire a specialized education at the disposal of a man without cost to him, and, true, your purpose may be direct and personal, but you cannot take it away from him once he has it. I was going to say, to illustrate my point of view, that the purpose is not philanthropic, nor is it charitable effort on the part of the employer. It is to enable the employer to sell everything that he is making as cheaply and quickly as possible through the medium at his disposal, that this recent movement of establishing commercial educational institutions has been worked out. The thing began with the National Cash Register Company. They found it impossible to obtain a sufficient number of so-called born salesmen to represent them over the country at large, and conceived the idea that they could take almost any man with a certain amount of common sense and of native ability and make that man better than the born salesman by training him. They sent representatives all over the United States to investigate special and commercial systems of training, and study the means at their disposal for preparing men to represent the company before the public.

I was greatly impressed by the presentation made by the Sheldon School of Salesmanship. I must say that, in my judgment, Mr. Sheldon should be given great credit for investigating and classifying the subject and giving us the nucleus of what will eventually become an almost classified science, the Science of Selling, or of putting it into the mind of the other fellow that he wants the thing you have to sell. I do not know what that mysterious process is; men without thinking do the very same thing and some men do it automatically; you simply cannot refuse to buy the thing they have to sell. There are other men from whom you would not buy the last or the best thing in the world, you would not buy from them under any condition, such is the effect they have produced on you. There you have the reason for the New York Edison Company's school of salesmanship. I wish Mr. Hendershott, the man who has devoted his time to the development of that school could be here to tell you about it. I think I have read nothing more fascinating than Mr. Hendershott's story of his study of the men who have come to him to be trained into good salesmen, and his method of instructing them. The colleges do not teach men the thing at all, nor is it taught in the schools. It is practically a new department of education.

I talked a few weeks ago with the president of one of our largest universities, who said that the university recognizes the need of this thing, and has in view the organization of a department from which men may be turned out properly fitted to represent large corporations in their relationship with the public. We have been more or less careless, I think, in not recognizing that teaching is just as much a profession as electrical engineering; it is perhaps a more difficult profession, certainly it is one in which the unknown quantity, the things not seen by the eye, not measured and weighed by mathematics are reached, developed and made useful. Teaching is one of the mighty professions in the world, and I think we have failed to realize that to instruct people properly we must reach them through the medium of a teacher.

We are employing trained teachers to carry on this work. The work itself covers very little of technical electrical engineering. I mean to say these commercial schools are, of course, technical, but the last thing you want to hear from a selling agent is the technical side of a product. You want something else, you don't know just what, but certainly not the extreme technical side of the industry. You want the man who comes to you to look as though he were a part of the best in human life; you want him to understand hygiene and health; and health is the cream of existence, you know. You want him to be well informed in matters of the day; if possible, he must know something of this new—I won't say science—this new department, this psychology of the other fellow. This new school should teach and train to develop big, broad, fine specimens of humanity whom you will be mighty glad to see, no matter what they may have to sell. I don't approve the idea that a man should go through the different departments of an industry, for the reason that a good engineer is not a good selling man; the good technical man is never a good selling man. He should have an acquaintance, but in my judgment, a passing acquaintance, with other parts of the business. Now, don't misunderstand me, or understand me as suggesting that technical knowledge of any branch of our business is undesirable. A man who goes through all the departments of work, but in passing through is able to leave the extreme technique behind him, is really the best man to get in the new line.

An important feature of the work is the classifying of the individual. That I repeat is the most important feature. Every one is surveyed. He is looked at, examined, made out, and surveyed, and this for his own sake as well as for the company. I have in mind one illustration. A boy came into the company at the age of sixteen as an office boy at $4 a week. In three years he advanced to $10 a week and was in charge of the records of the company, then kept in our general office. He was ambitious, and gave up the $10 a week job, and went back to $8 a week, beginning in the meter department. He went through the meter department, learned about all he could learn from that and then went into our commercial department at $17 a week. Now this young fellow made a good average, and he was treated fairly by the company in the meter department. A survey showed this: he had never had even a common school education; he had no executive ability; he had no administrative ability; he had no initiative; but he was a good team worker, he was absolutely honest, and he was ambitious. The question asked of the surveyors was, What do you think of this young man's ambition? He wished to become a salesman, yet had no aptitude whatsoever in that direction. Apparently his best chance lay in team work of an extremely technical and non-commercial nature. Now, coming back to his education: in his school examinations he went from about 60 per cent at the time of this inquiry to 77 per cent plus later on. The people employed by the company to examine the men so that they may be advanced as rapidly as possible into higher positions, said that he had apparently a large amount of native ability to acquire an education, but had never had the chance, and that the school was developing this latent capacity for understanding and learning, and that with larger development he had a very good prospect for the future. The card made out for this test case presented a perfect picture of what that young man had been, what he was, and what his prospects were for the future.

Napoleon used to say that it was the man, the army or the general who possessed the last bit of information who fought and won his battles. And I tell you to-day, it is the man who possesses not alone the last fact, but the largest fund of general information upon the subject which he represents, who is making a success in this world. And so it is for you who have men to represent you, to whom you desire to give the necessary start, to take them and fit them at your own cost thoroughly for the work you want them to do.

MR. GRANT: The discussion created by the paper has been most interesting and the recommendation made to the Executive Committee regarding the appointment of a committee on Education and Instruction is in harmony with the views brought forward. In thanking those who contributed to the success of the paper by their discussion, the author would like to add these comments:

Education means not only more salary, but greater efficiency, greater value to the institution, work done more easily, and consequently better co-operation and contentment.

One of the speakers although stating that he did not approve of class instruction went on to point out how valuable it had been in a particular institution, and in general it was noticeable that wherever any particular method of imparting instruction was opposed, the speakers before concluding made some remark which showed that after all every method of educating central station employees has its place and is valuable.

If I may be permitted a personal experience I would like to tell you how eighteen months' work in the Engineering Department of a Central Station Company proved invaluable to me when occupying a responsible position in the Commercial Department, and also how other engineering experience was also of value. Because of this and the principle which is involved, I am in accord with the idea of transferring men from one department to another. The more men who know your end of the business the easier it is for you to get it done; and to know the difficulties which beset the other fellow; and the way out, is invariably to stretch forth the helping hand. Reference has been made to the guilds and apprenticeship systems which in older countries made for thoroughness, gave each individual a good idea of the relation of his work to that of his co-workers, and thereby showed the necessity for close co-operation. We are told that specialization has made the guilds and apprenticeship systems unnecessary; that now, each man's part of the operation is something distinct. We should rightly refer to such a state of affairs as super-specialization, and there is therefore much to be said in favor of the system of apprenticeship, seeing that it not only teaches thoroughness and efficiency but also the relation of the parts to the whole—a proper perspective.

Dr. Adam Smith was one who strongly disapproved of apprenticeship on the grounds that it interfered, not only with the property which every man has or ought to have in his own labor, but with his liberty. In the apprentice system of trade education, the master agrees to teach and the apprentice agrees to diligently learn, and to serve the master for a specified time so that the profit on his labor shall net a fair return for his tuition. It is a contract pure and simple and may be made fair to both parties, in which event Dr. Smith's arguments would be void.

From France comes recent news that an exhibition of the work of apprentices is to be held in connection with efforts which have been made for some time past to encourage their system of apprenticeship. It is claimed that apprenticeship has the advantage of creating a greater stability in the employment of the youth of the country, and it is confidently expected that the result of these efforts in favor of the apprenticeship system will result in greater national prosperity. This may not seem entirely to the question, but the point I wish to make is that a man who has served his apprenticeship considers himself entitled to special consideration in view of the fact that he is a trained man, and further, that he has paid for his tuition. This brings out the further questions, Shall employees be taught in the Company's time or in their own, and shall attendance at school or lectures be compulsory or optional? And again, Is it fair to the Company to have to stand the losses while endeavoring to learn whether an employee, on trial, will make good?

Before hiring an individual as motorman—and the same condition is imposed in connection with many other occupations—he is put through a course of training, and in his own time, in order to determine whether his services will be satisfactory. In such cases the losses, if any, are shared; the man giving his time and the Company the tuition. If it has cost a man something to achieve a position he will be more likely to appreciate it, changes will be less frequent, and the number of men trained uselessly will be considerably reduced. Training is necessary in every branch of central-station service, and yet the new man does not seem to recognize this, as he holds a position only until he can find something better. The elimination of effortless instruction and the award of diplomas would tend to weed out the men who do not intend to stay in the business. Central-station educational work should be carried on in such manner that employees will feel compelled to attend for fear of losing something beneficial. This will dispose of the question of compulsory versus optional attendance.

The Gas Lighting Department of the Pacific Gas and Electric Company (San Francisco) has, under the excellent management of Mr. W. T. Pease, accomplished this much-to-be-desired end, and attendance at the meetings, which are held after working hours and once each week, approximates 98 per cent of the possible. I, personally, attend these meetings at every opportunity and always bring away something of benefit. They are held in a restaurant after the men—salesmen, maintenance men, fitters and office staff—have partaken of a hearty dinner for which they pay 35 cents each. The value of the dinner cannot be emphasized too greatly, and the men do not then have to disperse to their own homes before the meeting is held. A great many of the papers presented are worthy of wider audience.

As to the phases of work which might be taken up. These are numerous now and with the progress of the industry will become still more so. Just as rapidly as one use for our current is discovered we hear still another jar asking to be filled with the old familiar "juice." Central-station service is composite, and limited in its application only by man's ingenuity and skill.

There seems to have been some misunderstanding with regard to the proposed courses of study. These do not necessarily call for two or three hours' book study each day, although if this were so it would do the individual no harm, but book knowledge is necessary to some in order to keep up to date, and to others who through lack of education or the following of different occupations earlier in life have now to make such extra effort in order to overcome the lead of others. If a man forgets what he has read or studied, as one speaker suggested, it is because he has not used the information imparted. That knowledge is useless which is not used and unless it is used will eventually be lost.

THE CHAIRMAN: The next number on the program is an explanation by Mr. T. C. Martin, of New York City, of the proposed Company Section Lecture Bureau.

MR. MARTIN: Mr. Henry L. Doherty encouraged me to put my own ideas into the shape in which I now present them, merely by way of suggestion, and that they may be used in the actual development of a real working plan under this tentative scheme. The ideas came a month or two ago, just as I was making preparations for this convention, and you will readily understand that I have not done much with them in the interim, but I have succeeded in getting some work done.

PROPOSED NATIONAL ELECTRIC LIGHT ASSOCIATION COMPANY SECTION LECTURE BUREAU

1. Many of the Company Sections after the first burst of enthusiasm and energy find it difficult to maintain interest, or to secure or pay for original material in the way of papers and addresses. Even some of the larger Sections have elementary papers by members which can hardly give any new information or instruction, and do not carry enough authority to make them attractive to the membership as a whole.

2. It is believed that the educational value of the Sections, and the number and membership of the Sections can be increased by the foundation of a Company Section Lecture Bureau, which each season shall arrange in advance for a course of lectures to be given, free, on request, before Company Sections, so that a Section can be sure of securing first-class outside talent for its meetings, either to supplement its own local talent, or even to constitute an entire program sufficient to fill the season.

3. In a sporadic, casual way, some of the Class D manufacturing companies have already, through their employees, pre-

sented papers and addresses before some few of the Company Sections, and it is proposed to develop this idea into a system, in the belief that both the Class D members and the Sections will welcome warmly this opportunity of getting closer together in the diffusing and exchange of information.

4. As soon as the plan is launched formally, or earlier in an experimental way, each Class D company should be invited by the Association to prepare one or more lectures or papers to be presented before the Company Sections that would like to hear them. These lectures or papers are to be on new and interesting apparatus or inventions or on electrical questions of the day; and in every instance should be prepared by the best, or best known, man available as an expert in that branch of the art. Wherever easy or feasible, the author should himself present his subject, but as this will not be possible in many instances, the plan involves the preparation of the paper in advance, so that through the Lecture Bureau it can be read by some one else, preferably connected with the Class D company as a local engineer or agent. In this manner a paper by Elihu Thomson, Steinmetz, Edison, Paul Lincoln, Doane, etc., could be given the same evening, or the same week, before a dozen Sections scattered all over the country. All arrangements and assignments must be made through the central Lecture Bureau of the Association. Two or more short papers could be given in one evening, if necessary.

5. All papers should be prepared exclusively for the Association Sections. None of them should be printed before the end of the season by the member Class D company or by the technical press, or by the Company Section bulletins; but fairly brief abstracts could be prepared to hand out for publication. This restriction would not apply to the discussions.

6. These papers should, wherever possible, be illustrated by lantern slides, moving-pictures, photos or charts, but it is not proposed that the Class D member shall be put to the expense of the lantern. These can usually be hired locally at small cost.

7. The papers shall have as little of the advertising feature about them as possible. The advertising, while obvious, should be largely inferential. In view of the fact that already 8000 or 9000 members are gathered together in some forty Company Sections, it is thought that many Class D members will welcome

eagerly the opportunity to reach such audiences, and will find the expense very light and insignificant. All that is required is the working out of a system of the kind, and it is believed that its establishment would give an enormous but legitimate boom to the Company Section and the Class B membership.

8. The Lecture Bureau should be under the management of the Secretary of the Association or a Lecture Bureau Committee, and possibly all lectures before first presentation should be read at headquarters or by the Committee, as in the case of Convention reports and papers.

There would be some incidental expense in carrying the plan out each winter. It would need a person to watch the machine working, meet sudden calls, fill unexpected gaps and carry on the correspondence. Perhaps $1000 or $1500 would be required, to come out of regular funds or to be provided through a generous endowment. If the bulk of the *Proceedings* is curtailed, it might be explained to the members that some of the money thus saved is being spent in this manner.

9. The suggestion is made that the operation and advantages of the Lecture plan be limited to the manufacturers, etc., in Class D membership. This would probably be an added incentive to belong to and come into that Class. The Company Sections would be invited or requested to refer to the Bureau all offers of such service made to them.

Both in the preparation and the presentation of these notes I have found that they met with very warm approval and acceptance. Two or three of the largest of the manufacturing companies in membership have expressed their desire to assist and co-operate with the Association to the fullest possible extent in carrying out the plans proposed; and several subjects have already been suggested which I shall attempt to develop as actual working material at an early date in the fall season. I might mention as possible topics in addition to those I have already named, and going beyond the merely manufacturing or technical aspects of the subject, such lectures as that delivered by Mr. Rushmore yesterday evening in the Public Policy meeting, on The Panama Canal, its Construction and Operation. I have thought of the lecture given not long ago by Mr. Edwards of the General Electric Company, to the New York Electric Society on the Applications of Electricity upon the Farm, a lecture for which the society has received many applications, and which has already run through two or three large editions. Mentioning what I think to be of great interest to our Company Section, Mr. Doherty has recently devoted a great deal of attention to the subject, and has developed some highly original ideas on thrift in the industry and its relation to central-station employees, and he holds himself in readiness, at the service of the lecture bureau to give these thrift lectures during the coming season before Company Sections. When such men are willing to speak for us I think we need have no fear as to the future of our educational work. Mr. Edison himself, with the co-operation of one of his chief engineers, has already prepared a very interesting lecture on the Edison storage battery; and that lecture has been delivered with great approval before some of our Company Sections, the lecturer, in one instance, coming as far as Saint Paul to deliver it. Mr. W. H. Blood, Jr., vice-president of this Association has prepared in the last few months a very interesting lecture upon the Hydraulic Electric Plants of the Pacific Coast, which has been delivered on three separate occasions before our Sections. He has been requested to deliver it before three others; and to do this he has neglected his own business for the time being. All of this, of course, requires a good deal of planning and scheming, just as it would in the case of any lecture program or other form of entertainment. Dr. Elihu Thomson has volunteered his services to the lecture bureau in preparation of a technical subject, and also on his explorations of the Far West to determine the size and texture of one of the great meteorites which fell in the desert. I could mention other enticing matter, but unfortunately, my engagements in the main meeting room make it impossible for me to remain here. I wish now only to express my feeling that we have here a great opportunity for developing to a very high degree, the educational work to which this Association is now committed as a definite policy. It began largely on the initiative of Mr. Doherty, who, as I say, himself developed a plan of this kind, and has been good enough to give my still very crude ideas his warm support and approval. I shall be glad indeed if, while I cannot be here, the subject can receive some attention at this meeting, and I may be benefited by your suggestions and instructions, and even by your destructive criticism.

Mr. H. L. Doherty, New York City: This is a very important Section and I am disappointed that I do not find this room filled. I believe the Company Section is the backbone of the National Electric Light Association; it is the Company Section that we have to look to in making our progress; it is the Company Section that can do the most effective work, in bringing up the efficiency of central stations, in bringing up the efficiency of the men employed. Now, I hope that next year the men in this room will make a special feature of getting up a meeting for the Company Section workers that will be the biggest meeting of any in the session.

Mr. Martin was kind enough to try to give me the credit for his lecture bureau, but in a way, it is not my idea, it is Martin's idea. He is the man who started it, and he is the man to carry it out if he has the proper support. It is going to be a most effective thing. I am willing myself to devote a certain amount of time to it, and I believe that men like Mr. Freeman, Mr. Insull and many others whom you regard as exceedingly busy men, men who are busy, and whose time is worth lots of money, will be willing to go out and lecture to our Company Sections. Mr. Insull, I might tell you, by the way, is going all the way to Brooklyn on the 26th to lecture before the Brooklyn Section; and when you can form Company Sections that get the attention of the highest type of men in the industry, no central station should be indifferent to the advantages of that phase of the matter. Now if we are going to carry out this lecture-bureau idea effectively, it will be necessary to so arrange the engagements that a lecturer can make a round trip under comfortable conditions. If this can be done, I believe we shall get many of the very best men. You will pardon me for the suggestion, but I think you ought here at this meeting to pass a very decided resolution calling this matter to the attention of the Executive Committee, and asking them, if it meets with their approval, to give it immediate attention with a view to beginning the work at once. It is hard, as we have found, to maintain interest in the Company Section, and these lectures, whether spoken or read, will do a great deal to suggest topics and actually keep the work going. Now, I am willing to go further than that. I am willing, as one of the members of the National Electric Light Association, to recommend to the Executive Committee that it appropriate a certain amount of money to have lectures which are presented by local men at local Sections given elsewhere, paying the man for his time and travelling expenses. Probably many of you heard the lecture which was given here the other night by Mr. Williams, of the Northern Colorado Power Company. A great many people have heard of the uses to which electrical energy can be put on a farm. Here is a case of a paper stating and showing exactly what is being done, how much power it takes to pump water, and do the various sorts of work, where and how the apparatus is used. The vague idea is helped by this lecture; it will produce business for every central station. If there is enough interest in this to carry it through, I for one promise my hearty support and co-operation.

It was regularly moved, seconded and voted that the resolution be adopted.

(Adjourned.)

MINUTES

THIRD GENERAL AND EXECUTIVE SESSION

THURSDAY AFTERNOON, JUNE 13

THE CHAIRMAN, PRESIDENT GILCHRIST: The first paper this afternoon is on "Some Uses ot Metals." Doctor Whitney, who prepared the paper, is not able to present it, and Mr. Charles W. Stone, Schenectady, has offered very kindly to read it.

SOME USES OF METALS

The purpose of this paper is to take a sort of inventory of some industrial improvements and review some of the advances of technical research, but I have chosen to confine myself, for the sake of brevity, to the metallic elements.

I assume that a paper read before this Association should deal primarily with questions of electric lighting, and for that reason, while considering the advance in engineering and chemistry which makes general research useful, I shall use electric light matters, so far as possible, to serve as illustrations. But I must stray as far afield as the lights themselves must go for their illuminating energy—motors, generators and transformers becoming thus fair prey.

As an art like the electrical art advances it requires relatively greater and greater knowledge to create improvements in it. In its early stages a coil of wire wound about an iron core could be easily made useful, and new applications of this combination were introduced very rapidly. Gradually the new improvements became of second order. These were none the less desirable, but they were matters of more or less detail and required a knowledge of and a broadening of the limitations of the first cruder solenoids. The insulation of the wire had to enter a period of perfecting. The iron core began to submit to processes of mechanical alteration, to annealing, subdividing into wire or sheet, enamelling, insulating, etc., and then in turn the chemistry of the iron itself was studied, for the particular purpose of this electrical use. The applications of the first principle grew into the thousands, from the telegraph relay, the generator and motor, the telephone and the transformer, down to the wireless and X-ray outfits. Naturally, new inventions on these lines could and did come best from men who had learned to think in terms of the magnetic field. I think this may serve to illustrate a general trend of the application of science to art in our day. Specialists are employed because of the growing complexity. It is possible for a man unskilled in a particular art and untrained in science to make fundamental discoveries and inventions, but the teaching of German experience for the past century is of no value to us if we do not recognize the dependence of the world's industries, particularly the electrical and chemical, upon German philosophical methods of study and research. It is painful, with our sure feeling of racial inventive power, to recognize that practically all of our industry is based on apparatus and ideas first worked out by some well-trained and industrious foreigner, usually in some quiet and stuffy German laboratory. But such is the case. Our electric generators and motors, our transformers, primary cells and storage batteries, and most of our electric lights are of German origin. They were each the result of pioneer work, which usually at first showed little or no trace of its subsequent practical applicability. In cases where it seems as though we Americans deserved some credit for inventions, it will be found that what we have done is usually to develop into more practical form an idea which came from abroad. There is nowadays little or none of that kind of useful invention which consists in developing in a few hours an idea which, like a flash of lightning from a cloudy sky, lightens the horizon in an instant. On the contrary, just as in the past in Europe fundamental principles have been the product of extreme and extensive effort, so in modern specific research applied to the electrical lines, there is no shorter road. The way is still the old one of direct and continued effort, with all the appliances and means to boot. This is well illustrated in the history of our modern research efforts.

The chemist naturally likes to analyze even an engineering situation, and probably most chemists, in looking over the pioneer work of the last twenty-five years, would be tempted to revert to our original material alphabet, the chemical elements. There are about 75 of these elements. For our engineering purposes we may even exclude the non-metallic elements, so as to get a closer view of the residue. We naturally, too, look at the electric light industry as concerned at first with only two or three of these elements; let us say, with copper and iron. These two are surely the bone and sinew of the industry. They are the two oldest elements. As far as these are concerned, Caesar, Alexander, Moses and Abraham might have used electric lights. We are so accustomed to these two metals that we question the chemist with the analytical trend when he tells us that there are other metals more common in Nature's storehouse than either of these. The chemist sees the little group made up of these two, with six others, constituting the total metallic assets of the world down to our own century, and then he wonders at the amazing fact that nearly twice as many new metals have been introduced into the industry as separate metals, in the last single per cent of the total time. It is the uses, modifications, purification and alloying of these metallic elements with which I hope to interest you at first, in a general way, because of their bearing upon the electrical advances.

Copper is probably the progenitor of all the metals. Production statistics may not be of interest, but the fact that great purity is of prime importance is worth noting. The presence of even very small quantities of one of many impurities, greatly increases the electrical resistivity of copper. Fortunately, the electrolytic refining methods by which a very large proportion of our supply is now produced give a metal practically pure. If it contained, for example, one-tenth of one per cent of such common impurity as arsenic, the C^2R losses of the world would rise about 30 per cent. This could mean one hundred to three hundred dollars, at one cent per kw-hr., extra loss per ton copper annually, or correspond to the tying up in capital of two to five thousand dollars per ton of copper. Expressed in another way, it would correspond to an increased capitalization in copper of twenty million dollars each year for the apparatus made by the General Electric Company alone. No one thinks of using such poor copper, but perhaps we are not using the best. If copper at 96 per cent conductivity, which is common, were used in a 700-kw machine instead of 101 per cent conductivity, which might be easily obtained, and if power were worth one cent per kw-hr., the resistance loss when running full load would be over 10 cents per hour. The use of the better copper could reduce this to 9½ cents and the rate of saving would correspond to 6 per cent interest on a capital of about $700.

There are many factors which influence such a situation, and they are continually shifting. It is part of the duty of the engineer and research man to take advantage of and to produce improvements.

The application of copper in the brasses and bronzes is a field by itself. The requirements in this field are in many cases severe, and are perhaps not of direct interest to the electrical engineer. But in this connection it might be worth while to refer to hardened copper, not because it is, but because it is not. One of the interesting events in life to most engineers is the arrival of the inventor with the hardened copper and the lost art of Egyptians or Babylonians. We have several times investigated such coppers. It has come to us as trolley wheels and as wire, as axes and as razors, and again simply in lumps. Thus far it is interesting only as a diversion. One factor seems to militate against the inventor of hardened copper, although it is not mentioned here to discourage him. No one can safely assert that a copper much harder than steel may not be producible (better assume the reverse), but a fact, which is also of importance, is, that unless harder than the best razor steel it could not expect to compete with it in price, as long as its basic metal costs ten times as much as iron. For electrical purposes in most uses the hardening agents so greatly increase the resistivity of the copper as to be prohibitive.

Recently a step of great importance has been made in the casting of copper, to which reference should be made. It was formerly impossible to obtain a cast copper having the density and electrical conductivity of the drawn pure copper. Now, through the use of boron, which itself is an element added to the group of available isolated elements within the past two or three years, copper may be cast of high conductivity, high density and freedom from blow-holes. As squirrel-cage types of rotors are already cast in place after the iron is assembled, we must prepare for other innovations along this line.

In the electrical industry numberless experiments are still being carried out to determine the effect of repeated low strains and vibrations upon the strength of copper, so as to do away with more of the breaks in suspended wires and cables. Even the presence of jute cores in stranded cables is being studied, as it has an effect all its own.

Copper is also being alloyed on its surface to reduce wear, it having been found that aluminum bronze may be produced on copper surfaces which resists oxidation even at a red heat, and the alloy is hard enough to be of promise in a number of ways. But iron is the engineer's important and indispensable metal, and while recognizing the possibility of being prolix and elementary, I want to recall to your minds the modifications of iron in which we are interested. They are getting to be larger in number than most of you realize.

I will only refer in passing to the various cast irons with their approximate compositions particularly fitted for special work. Heavy castings, such as some of our large turbine bases, are not made of that kind of iron which would be suitable for castings of small size or delicate structure. Cast iron resistance grids, for example, require special iron. Again, we know that cast iron which is later to be malleableized, is a special composition, and experiments are still going on looking to the further improvement of this malleable iron. You also realize that cast steel is a further modification of iron and that it would be out of the question to use cast iron for the uses to which cast steel is put, and there are also cast steels of various qualities. Then the wrought iron holds a field of its own which none of the others seem capable of filling. Knowing purchasers of pipe, for example, will demand proof of the existence of the included slag which characterizes this material, even if the other properties are essentially the same.

The immense class of steels is growing greater every day, and many, if not each one of the newcomers fill a real gap. To even name them all seems hopeless. Among the tool steels alone, used by our Company, there were a year ago 16 varieties. Carbon steels were first in the field and crucible steel has been a name to trade on for years. In these carbon steels the amount of carbon was usually the determining factor of the quality, but the presence of several other elements was long known to be of effect. Just at the critical moment when boring mills and lathes had to be run faster and also to take larger cuts in order to keep up with demands, the air hardening or high-speed tool steels came into use and there are now a number of them. Primarily, these are alloys of iron with a little carbon, a high proportion of tungsten (10, 15, 20 per cent and more), and some chromium. When this field was opened and it was seen that instead of cutting at a rate of 25 or 30 pounds of chips an hour on a lathe, a good tool could cut 75 or 100, a number of modifications of the earlier formulae appeared. Here again I only wish to convey the idea that practically all the metallic elements which the chemist had discovered were tried singly and in pairs, admixed to iron with the single purpose in view of making an alloy which would stand up as a cutting tool. Certainly these alloys have all got to be made and tested again for other uses as the arts advance. Their use as permanent magnets, such as meter magnets, will occur to you at once, for example.

The advent of the electric furnace has made the preparation of iron alloys more than ever attractive, because now the melting of even very refractory mixtures, such as those high in molybdenum, chromium, tantalum, titanium or tungsten, is relatively easy.

It may not be out of place to state that at present there are at least 125 electric furnaces in Europe and America which are producing various grades of high quality steel.

I think the analyst, on hurriedly looking over the research field, would be inclined to say: "Tell me what metal has not been alloyed with iron to make a useful compound and I will produce a useful alloy with it; and of those metals not yet commercially obtainable let me later find their uses in iron." I will not attempt to cover this point completely, but will consider the discovered uses for these newer metals in iron.

Soon after aluminum was commercially obtainable, it began to be used in most of the foundries and steel plants and served to deoxidize the metal. It is now largely used for this purpose. Titanium, which used to be a bugbear to the iron producer, was soon tried for its possibly useful effects on iron, and now thousands of tons of this alloy are used in the railroad rails of this country. This very interesting metal, titanium, deserves more attention than I can give it in this connection. When pure it is a white steel-like element, non-magnetic and malleable, but at present the production of it, even in only fairly pure form, is difficult and expensive. There seems to be plenty of its ore ready when needed. It certainly awaits a future use, if one may judge from the history of our other metals. Its use as carbide in arc lamps is a promising one, and thousands of arc lights owe most of their brilliancy to the titanium contained in the so-called magnetite electrodes. Recent investigation has shown that white flame arcs of carbon electrodes, which contain titanium salts, can be produced of very high efficiency, and this whole field is being rapidly covered by research.

Chromium, which has been available as a metal only since the advent of cheap aluminum, by the use of which it is reduced from its oxide, has already been mentioned as an apparently necessary component of most high-speed steels. It has other uses also. Tons of it are used in alloys with iron, nickel, manganese, etc., as nichrome, calorite, etc. These alloys have superseded most other resistance material for heating devices, rheostats, etc. While they have very high specific resistance, they also withstand prolonged operation at red heat in the air.

In this way we see also very modern use for the metal manganese, which, like chromium, has only been obtainable as metal by means of the reduction of its oxide by aluminum.

Vanadium is another very recent metal. In fact, few people have ever seen even approximately pure vanadium. Its alloy with iron is easily produced, but the metal itself has been only little studied. Together with several other rare metals, it was isolated and tested for incandescent filament material a few years ago, but was not found equal to some of the other metals for this purpose. It seems probable that the quantity of this metal to be obtained as ore may never be great enough to permit of such an extensive use as the metals aluminum, chromium, manganese, tungsten, etc., permit, but fortunately its presence in high-grade spring steels is required to only a small degree.

Molybdenum, which is another metallic element of which we could now have hundreds of tons if we wished, has found use in iron alloys in the case of magnet steel, as it makes a magnetically hard alloy, suitable for permanent magnets. Tungsten is often used to replace it for this purpose. During the attempt to produce pure tungsten and to draw it into wire, a great deal of work was carried on in the Research Laboratory.

Before the tungsten wire was a commercial possibility, the molybdenum wire was used in the paste-process type of tungsten lamp to support the tungsten filaments. Thus both tungsten and molybdenum are now used, not only as iron alloys in tool and magnet steels, but also in the pure state, in incandescent lamps. There are not many other new metals, and what there are have been gone over carefully for the electric light industry. They have been tested as incandescent and arc material, with various results. Thorium, uranium and zirconium practically complete the list. These metals are too easily volatilized or melted to serve as filaments. They or their compounds may well find use in arc electrodes or in special alloys.

Boron and silicon are two relatively young elements, and they, too, have already been added to the great central element iron, although they are not classed as metals. Commercial use has not yet been demonstrated in the case of boron in iron and the cost of the element itself is still quite high, but a use is probably "on the lap of the gods." On the other hand, there seem to be plenty of the boron ores and the cost of reduction to the element will doubtless be lessened.

The whole electrical industry is now tied to the silicon-iron alloy. The highest grade transformers make use of an alloy of about 4 per cent silicon. Silicon itself is derived from the reduction of sand by carbon in an electric furnace and is now made in large quantities at Niagara Falls. Its effect on iron is to greatly increase the resistivity, which in turn reduces that part of the core loss due to eddy currents induced in the iron, and its presence also reduces the energy lost in the magnetic hysteresis. If the cores of the transformers sold by the General Electric Company last year had all contained the high-grade common iron, as used to be the case, instead of the silicon alloy now largely used, the additional loss, when they were all operating, would correspond to about $15,000 per day at the 10-cent rate. This insidious type of loss will always be an object of attack by the experimenter, because it seems absolutely unnecessary. No one knows that a magnetic hysteresis *must* exist; we simply know that it *does* exist, and moreover, that it is being continually reduced by discovery. I call it an insidious loss because it is going on all the time and doing no good. It is not quite like the resistivity of copper, because the latter has definite value, dependent upon the temperature. By excessive purification, we can get a copper having a minimum energy-loss which is apparently fixed, but at present the magnetic hysteresis value of iron seems reducible.

While I have tried to show how practically all our newly isolated metals have already found very useful fields in the single companionship of iron, I have not taken up the myriads of alloys now possible when two or more of the newer metals are combined. This seems a very fertile field, and since the properties of new alloys can usually not be predicted from those of the components, we are sure to find something new. Perhaps monel metal, the alloy of copper and nickel, illustrates this point, but among others I have seen a cobalt-chromium alloy used in place of steel for knives, etc. As it cannot rust, there may be considerable use for it. Evidently the uses for cobalt itself will quickly increase when the price reaches that of nickel, as in at least some uses they are interchangeable.

In order to make the possibilities still greater with new alloys, the electric furnace methods have received a number of improvements in the past few years. You are doubtless familiar with the two general types of electric furnace, such as used for steel work—the arc type and the induction type; but perhaps nearly as important, because more flexible and available to experiments, are the small furnaces in which a few ounces of any conceivable alloy may be produced. When a pot furnace which could only melt copper with difficulty and usually could not melt pure iron at all, was the limit, there was not much chance for studies of special alloys of high melting-point, nor for alloys which easily oxidize, nor yet for those which combine with carbon, as most of them do. Nowadays we have the electric vacuum furnace, which carries us several hundred degrees higher than before. Beyond this, for many purposes, there is the furnace or crucible which, operating in hydrogen or in nitrogen and heated by a coil of tungsten or molybdenum wire, lets us melt practically anything. At present this type of furnace is limited only by the material of which the crucibles are made and can easily be carried up to a temperature at which all the well-known refractories much too easily melt. When one reflects that our industries have always depended on what could be done below a temperature of about 1600 degrees C.; that our porcelain mixture, as well as our alloys, our metallurgical processes and all our applications of heat, have been influenced by this upper limit, we look forward with interest to the effects which may be produced by making available in the next few years a temperature at least 500 degrees higher. Fundamentally new results ought to be anticipated.

It is natural to expect specific illustrations of use in such cases. One which can be easily appreciated may be outlined in a few words. As many alloys as practicable are now being carefully studied as to their properties. Many of them have never been made before. Among the properties to be determined are the malleability and ductility, the expansion coefficient, the electrical and thermal conductivities, the oxidation when heated in air, the melting-point, etc. Such data will serve many useful purposes. For example, those having practically the expansion coefficient of glass may be tested for leading-in wires to incandescent lamps, to displace platinum. Those having highest thermal resistivity are being tested for use in electric cooking devices, such as oven throats, where loss by metallic conduction is considerable. This class of data is extremely valuable, and the acquirement of it by someone could hardly be postponed longer. The properties are being plotted in curves and surfaces. For example, three-component alloys are being plotted so that the possible resulting properties are made to appear like the elevation lines on a contour map or the isothermals on the weather map. If, then, we are looking for the composition corresponding to the extreme in any property, we can find it just as one locates a hill on a contour map or a storm center on a weather map.

One very simple and interesting application of these high temperature furnaces has been in the production of artificial dies for drawing wire of different kinds. It is well known that steel and chilled iron draw-plates are easily worn out, and that diamonds for wire drawing are available only at very small sizes and are very expensive. By the use of compressed and pure alumina, dies of any size may be easily made, and being practically sapphire, they are very durable. After being formed as porcelain is formed, it is necessary only to heat them to about 2000 degrees C., to produce the requisite density. Undoubtedly the use of such high temperature furnaces, which for a time may be confined to small units and particularly desirable materials, can ultimately be extended to produce any porcelain-like materials of any degree of hardness or permanency against attack by reagents.

After nearly eight years of work on tungsten in connection with its availability as incandescent lamp filament material, and when finally the earlier processes of squirting the powdered tungsten, mixed with some kind of paste, were done away with, we had reached what seemed the simplest form of the material and the best method of procedure. We had then such a fund of experience and knowledge of the properties of this metal that we were forced to try it in other fields than in incandescent lighting. This work is still going on. It has such a high melting-point that it will certainly replace platinum for many uses. At present it is being used for X-ray tube targets and for contacts in many types of electric arcing devices, vibrator contacts, relays, etc. Many thousands of such contacts are going into automobile apparatus at present. Owing to its very high specific gravity, tungsten should mark a stride in advance in ballistics; it is nearly twice as heavy as lead and is being given tests in projectiles. It is so little attacked by corrosive agents in general, such as acids, that when large vessels can be cheaply made of it, new uses will be found for it in chemical works, etc. Its use in special tools, particularly where iron is unsuited because of its rusting, is quite promising.

THE CHAIRMAN: Doctor Whitney's paper is open for discussion.

DISCUSSION

MR. C. E. BOGARDUS, Seattle: How many of the different lines of science are bound together in the use of a metal. First, the chemist who discovers it, then the metallurgist who finds some use for it; the manufacturer who makes it into machinery or the electrician who puts it to electrical use; then the capitalist who builds up the business of selling—all are bound together by the metal. The idea of electrical progress, with its possibilities, is especially interesting to us Westerners. We have so much copper out here on the Coast and in Alaska that we feel that with the development in electrical lines which is going on it will do a great deal for us. But there is one thing in regard to the electrical furnace that will have to be changed to a certain extent for development. The idea up to to-day of so many who have been working on an electrical furnace for the refining of ores, has been the point of heat. We have thought that if we could get the heat we should have all that was necessary to handle ore of any kind. But that is just the starting point. The heat is necessary, of course, in handling ores, but there have been many failures in that very line by men who were not metallurgists and who do not realize the value of metallurgy or chemistry as applied to electrical work. I have in mind one man who is working on this problem. He has interested some people by his broad statement: "We are going to treat gold, silver, lead, copper and zinc ore; we are going to melt it and draw off the lead from one, the copper from another, the zinc from another, the gold from another and the silver from another." It is very easy theoretically, but it does not work out in practise. Gentlemen, the possibilities for the electrical furnace are great, but only if the chemist, the electrician and the metallurgist work together.

One gain in the development of the electrical furnace which will be of great benefit to the electrical field will be the purity of the metal which can be obtained for use in electrical work. To get the least little fraction of a per cent beyond a certain point in the purity of a metal makes its cost extremely high, but we shall yet have to work through that point.

An idea has come to me in regard to new metals and their possibilities. Many of the Association members here are Eastern men and possibly do not realize what Alaska really is. The field there is just beginning to define itself, and it is an immense field with enormous possibilities. We have just begun to open up the "prospects" of copper in Alaska and to produce copper from there. Last year we mined one per cent of the copper output of the United States, and we are just getting started, but that one per cent put Alaska number seven among copper-producing countries. Now we have found tungsten associated with tin up around the Seward Peninsula. Tungsten is becoming very valuable through other fields of endeavor and as I say, the Alaska field is hardly touched. The ordinary prospector knows very little in regard to the metals outside of gold, silver, lead and copper. You are all interested in the finding of the newer elements; would it not be a great advantage if the Association could take up some proposition for having a small collection made of the rarer metals in which you are especially concerned and have it exhibited in the Chamber of Commerce here, or in some place where Alaskan prospectors could see it? They want to find these new metals, but they know nothing about them. If they could have descriptions or small specimens, there would be many to look for them, and it is only by the prospector that they are going to be found. The metallurgist does not find the metal in the field. The prospector does that. You have got to depend upon the prospectors, and where they recognize only gold, silver, lead and copper they are not looking for the others. They are looking now for platinum, and just this past year there has been quite a bit found in Alaska. You may remember that a few years ago one of the wealthy Denver mining men sent out specimens of the uranium metals and asked prospectors to find them. That aroused more interest in uranium than had been felt in years, and I think that good results might be obtained by educating the prospectors of Alaska to these rarer metals with which they are not yet acquainted. They will find them, for they are in Alaska. [Applause.]

MR. STONE: I think there is a great deal in what the previous speaker has stated about educating prospectors to new metals. Our calculations are based upon the price of metals as they can be obtained. We do not know, without experimenting, what can be done with metals, and unless we have a big source of supply, we are apt to drop all investigation.

Another point brought out by the paper and its discussion is that the introduction of new processes for making alloys is most difficult. Doctor Whitney speaks, for instance, of boron. Every foundryman will oppose experiments with boron, saying you will heat the metal to a point where it will be burned beyond usefulness, but we have succeeded at our plant in producing copper castings of the highest degree of conductivity by getting the metallurgist and the chemist to work together. Doctor Whitney mentions the coating of copper with an alloy of aluminum which makes it non-corroding. It is called calorizing, and its usefulness is slowly being found out. We are now trying it on soldering iron. With this coating we can increase the amount of heat nearly four times.

The use of tungsten in X-ray tubes has opened up a new field of endeavor. Previously, the limitation in X-ray work was the melting point of the platinum, but the limiting point to-day is the melting point of the glass surrounding it. We can now take better pictures, and the indications are that we shall soon be able to take moving-pictures by X-ray, while by the use of bismuth salts can see the entire process of digestion, something that could not be done before the introduction of tungsten. [Applause.]

THE CHAIRMAN: The next number is the report of the Committee on Street Lighting, by Mr. J. W. Lieb, Jr., of New York City, Chairman.

REPORT OF STREET LIGHTING COMMITTEE

INTRODUCTION

The Committee on Street Lighting of this Association was created to be of assistance to the member companies in the solution of the problems arising in connection with the lighting of the public streets by electricity—whether those difficulties are of an economic or of a technical nature. No consideration of the subject would be complete which did not treat of both these phases, and it is the inter-dependence of these features which has made the work assigned to the committee one of peculiar difficulty. Were the problem purely one of the physics of illuminating engineering, in which the facts are capable of being expressed in definite values and the data can be arrayed strictly on lines of unit values or equivalents, the approach from the purely technical viewpoint would be easy, and the path to be followed less strewn with difficulties. In matters of illumination, however, and street lighting forms no exception to the rule, the problem assumes also economic features with side excursions into the paths of esthetics, physiology and even of psychology.

It is in the difficulty of expressing and of comparing illuminating values and effects directly in known physical units or equivalents, where these several factors individually or in combination are operative, that the complexity of the problem becomes apparent.

The difficulty of giving adequate consideration to such important local features as the environment of the source of illumination, character of the buildings facing the street, the material and condition of the sidewalks and roadway surface and the presence of trees or other street obstructions, makes it well-nigh impossible to present a satisfactory basis of comparison between the effective light emission of different sources and their different values in providing adequate street illumination. The situation becomes still more complicated when it is a matter of assigning a comparative value to the physical operating causes in terms of the physiological effects produced.

Before entering into a general discussion of the comparative value of illuminants and a consideration of the specifications which should govern them in framing a street lighting contract, it may be well to consider the attitude which previous committees of this Association, assigned to this subject, have taken.

HISTORICAL

Previous to the year 1894, the type of arc lamp in general use was the open arc, which, for street illumination, was generally of the series type, usually continuous-current. It was commercially designated as a "2000-candle-power" lamp, but the necessity having arisen for a definite and authoritative pronouncement which would define the lamp more specifically, a committee of this Association presented a report to the Seventeenth Convention, held in Washington in 1894, recommending the following preamble and resolution, which was adopted by the Association:

> "Recognizing the difficulty, if not impossibility, of measuring with any degree of accuracy the illuminating power of the arc lamp, and the great necessity for a more precise definition and statement of the obligations of the producer of electricity for illuminating purposes to the consumer thereof, be it
>
> "*Resolved,* That in the opinion of this Convention what is ordinarily known as a 2000-cp arc lamp is one requiring on the average 450 watts for its maintenance, the measurements being made at the lamp terminals, where no sensible resistance is included in series with the arc. In case such resistance is used, it must be excluded in the measurement of the voltage."

These resolutions applied strictly to the two standard types of continuous-current arc lamps which were the only types then in commercial use; the several continuous-current and alternating-current enclosed types of arc lamps did not appear in sufficient numbers to be a factor in the street-lighting industry until 1899 and 1900. On their advent difficulties soon arose in making comparisons of illumination.

At the Thirtieth Convention, held in Washington, D. C., in 1907, a committee to consider specifications for street lighting presented a carefully prepared report in which this matter was thoroughly discussed and definite watt ratings were adopted for the several standard types of continuous-current series open arcs, continuous-current and alternating-current series enclosed arcs, and the magnetite type of luminous arc, which had just made its appearance. No attempt was made at that time to cover the several types of flame arcs which had already received considerable application in Europe, but had not made much progress in this country.

The committee laid down certain specifications, on the basis of which the illuminating values of the several types were to be determined, but definite figures were not obtained until the following year (1908), when, as a result of extensive tests made in various parts of the country on lamps operating under first-class service conditions, a series of so-called X values was obtained, the value of the light sources being expressed in terms of the illumination given by a standard incandescent lamp of 16 candle-power placed at 1/X of the distance. These X values are reported in the *Proceedings* of the 1908 Convention of the National Electric Light Association.

While it was appreciated that it would be impossible to arrive at absolute values for the various lighting units, it was deemed expedient to attempt at least an approximate basis of comparison, to be modified from time to time as the development of the new types of illuminants and the art of photometry advanced.

An analysis of the data collected confirmed the impression of the 1907-1908 committee as to the impracticability of an absolute average foot-candle rating, and it was, therefore, decided to group the lamps broadly into certain classes and set a mean-foot-candle value, giving weight to the several factors which have an important bearing on the relative illuminating values of the different units. For instance, comparing the 7.5-ampere, alternating-current, enclosed arc lamp with the 9.6-ampere, continuous-current, open arc lamp, the following average foot-candle values were obtained at a distance of 250 feet:

7.5 Ampere Alternating-Current Enclosed Arc

Highest Lamp	Lowest Lamp	Average
.0064	.0036	.0046

9.6 Ampere Continuous-Current Open Arc

Highest Lamp	Lowest Lamp	Average
.0100	.0031	.0057

Treated, as it was, purely on a foot-candle basis in this comparison, the open arc apparently had the advantage. It had, however, an inherent characteristic of climbing to an abnormally high value and suddenly dropping to a low value and, while the minimum light might be sufficient at a point midway between lamps, the sudden change from high to low intensity in many cases could not be compensated for by the eye with sufficient rapidity to make the light adequate to avoid a possible accident, especially in the case of a rapidly moving vehicle. The effect of eye fatigue was further intensified by the relatively high intrinsic brilliancy of the source and the concentration of the light in the immediate vicinity of the lamp. The contention that this could be considerably reduced by placing the open arcs 40 or 50 feet high, while true, was impracticable in many cases.

The open arc, as ordinarily installed, was also handicapped by a dark shadow beneath the lamp and swinging shadows from the side rods.

In addition to the variation incident to feeding under normal conditions, there was a wide change in characteristic due to the wandering of the arc. In humid weather, also in rain, wind, sand storms and snow storms, the flickering increased greatly and the lamp dropped frequently to the hissing point, causing almost total extinction at intermittent periods.

On the other hand, the 7.5-ampere, alternating-current, enclosed arc lamp has an inherent variation due to the wandering of the arc, but of less magnitude than with the open arc, and the feeding is a question of hours rather than minutes. Furthermore, the pick-up to practically normal value is instantaneous; and when properly adjusted and given reasonable attention, the lamp has no so-called hissing or flaming points. The shadows so evident in the open arc have been reduced to a degree where they are not objectionable. While the intrinsic brilliancy is lower the light distribution is very much better, and for these reasons this enclosed arc was rated by placing it arbitrarily in the same class as the open arc.

Arc lamps as a class have widely different characteristics and each lamp has also an individual characteristic which may differ to a considerable extent from that of other lamps in the same circuit. Due to these wide variations the normal performance could not be determined within close limits and the only course possible was to set a mean average value on what appeared to be a fair estimate made from the data procurable at the time, these values to apply to the mean of a reasonable number of lamps in the circuit under test. This in itself would not detect lamps operating below normal in a circuit where abnormally high lamps would offset abnormally low ones. In order to protect this situation an additional table, giving minimum as well as maximum values for individual lamps, was included as a guide to normal individual lamp performance.

PRESENT SITUATION

With the rapid disappearance of the continuous-current series open arc and a present tendency to displace the later alternating-current series enclosed arcs with luminous arcs or with flame arcs, and the remarkable impetus given to electric street lighting by the important improvements in tungsten incandescent lamps, the difficulty of making comparisons of the illuminating effects produced by the several types has increased enormously. Here we have illuminants differing widely not only in total flux of light but also in the color values, in their steadiness and their light distribution. In the assignment of the X values previously referred to, a laudable attempt was made to express numerically, by the assignment of concrete figures, the illuminating values of light sources differing in physical characteristics, in operating peculiarities and in physiological effects. This, however, was an almost hopeless task and resulted at best in a fair approximation rather than in a final determination of equivalency constants.

Your committee was early confronted with the problem of undertaking a revision or extension of these values, or embarking on a series of investigations and tests with a view to determining new values, including also the later types of lamps.

It must be remembered that a comparison between the old open arc which has nearly disappeared in practise and the enclosed alternating-current arc which is tending rapidly to disappear, is practically a comparison between the obsolete and the obsolescent. The comparison between the two has also involved the usually very unsteady operation of the older form, and its habitual installation in a clear globe, which was largely responsible for its glaring character and its somewhat inferior distribution. In the earlier committee report of the National Electric Light Association these factors weighed heavily in the comparison and were given a predominant value in estimating the usefulness of the less powerful but steadier alternating arcs.

With the more modern forms of arc lamps, whether the luminous arcs or the recent forms of flame arc, open and enclosed, there is a constantly increasing tendency toward improved steadiness and increased diffusion and better distribution secured by the judicious application of suitable globes and reflectors. In the present-day illuminants, therefore, the importance of the differences which existed between the earlier illuminants, due to physiological and pyschological effects, has been greatly reduced and there is now much more justification for comparison based on total luminous flux than existed at the time when the relations between the open and the enclosed arc lamps were under consideration. In other words, in comparing modern light sources designed with reference to their suitability for street illumination, the basis of judgment must be to a considerable extent their m.s.cp., since modifying factors which once existed are progressively becoming of less and less importance. This does not imply that the distribution curve of a lamp is without importance or that one light may not be upon the whole better fitted for a certain service than another light, but that in the progress of the art these differences are as a matter of fact generally of a minor character and the quantity of light is the factor of predominant value.

In the light of some recent tests, including the review of the results obtained by the Railway Commission of Wisconsin in its investigations in Sheboygan, Beloit, Eau Claire, Stanley, Menomonie and other cities, it appears that the X values assigned in the 1907-1908 National Electric Light Association reports are on the whole not unreasonable, although they have not been considered as altogether acceptable as a basis on which to draw up street lighting contracts, and they have not received any practical application.

It was considered doubtful, therefore, if any new tests along these lines would be of advantage to the industry or of assistance to the member companies of this association, and after a most careful consideration by the committee, assisted by an able advisory committee, it was deemed unwise to undertake them.

The important improvements introduced in the tungsten lamp of late, the drawn wire filament with its greatly increased ruggedness, the new treatment resulting in improved efficiency and better candle-power maintenance, particularly in the larger sizes, have given a great impetus to the extension of electric incandescent street lighting. These lamps, either of the multiple or series type, the latter when being inserted where desirable directly in the series arc circuits, have by giving a greater flexibility to the electric service made it possible to secure a general extension of electric lighting throughout all streets and avenues of a given territory. This desirable long-hour business at remunerative rates has thus been obtained without considerable special investment. The increase in the standard of illumination so manifest now on our main thoroughfares, creating a demand for lighting units of higher illuminating values, has made it necessary to increase also the illumination of the side streets if they are not to appear as mere tunnels connecting brilliantly lighted main avenues. In many of our large cities nearly all of the streets are provided with electric service, often on both sides of the street, and it is frequently found practicable to add a considerable additional load to the general commercial circuits without additional outlay, excepting for short services and lamp posts, for which the city authorities or local associations of merchants and store-keepers are generally prepared to make the investment.

It is no doubt true that there is a lamentable lack of accurate information and reliable data as to the effect on the illumination and the actual lighting results due to such factors as the spacing and height of lamps, the type of reflectors used, the reflection from building fronts along the streets and other local conditions. These conditions are not, however, peculiar to this branch of illuminating engineering, but obtain in almost every branch of that art which is now in such rapid process of development.

To provide the necessary data by suitable tests requires large facilities, exhaustive observations and the simulation of a number of varying conditions, not to say anything of the time and expense involved. It is a full appreciation of these conditions, peculiarly the elements of time and expense, which has discouraged your committee from undertaking a special research along those lines.

THE INVESTIGATION AND TESTING OF ILLUMINANTS AND STREET LIGHTING SYSTEMS

To indicate only briefly the factors which should be covered in such an investigation would far outrun the limits of this report, but it may be desirable to refer briefly to some of the more important features that should be covered in case any enterprising local company may have the public spirit to undertake it and to give the industry the benefit of it. It may also be a guide to some institution of learning that may be seeking an attractive subject for thesis work for its students, affording valuable experience in the use of instruments and apparatus of different kinds and the plotting, tabulation of observations, serving at the same time the purposes of practical instruction and making a useful and needful contribution to the art of illumination.

Most of the work, whether scientific or otherwise, which has been done in connection with determining the illuminating value of street lighting systems, has dealt with the individual lamps or units which constitute the light sources of any given system of street illumination. An important consideration which must be borne in mind when viewing the question in its general aspects is the distinction between the lamps considered individually as street lighting units and collectively as a complete street lighting system. It is conceivable that diverse conclusions might be reached in a given case, depending upon the viewpoint, with reference to this distinction.

Municipal street lighting is intended to accomplish two classes of purposes, the importance to be assigned to each purpose varying with local conditions: one to assist in policing the streets, to facilitate discernment of objects in the streets and to detect irregularities in the street surface; the other to render a certain locality striking and attractive—that is, an advertising purpose. Depending upon the point of view with respect to this distinction, the conclusions as to the relative merits of two given installations might conceivably be greatly modified.

Conditions Which Should be Considered in Making Comparisons Between Street Lighting Systems

Character of Street

In considering different classes of thoroughfares, business streets, residence streets, parkways and outlying residential districts, it is recognized that the illuminating requirements are essentially different. Illuminants of high power are often found objectionable in purely residential streets and, on the contrary, they are necessary to provide the brilliant and attractive setting for a lively business street.

Character of Street Pavement

Between an asphalt street and an oiled or tar-treated road, or between an asphalt street which is kept clean and a dirty cobble pavement, there are large differences in light reflecting power. In the first case, a notably lower illumination intensity may produce equally effective street lighting.

Character of Surroundings

Between a street lined with light colored, closely built structures and a street having numerous gaps and with trees and shrubbery along the curb, the lighting requirements are essentially different.

All of these extraneous conditions are likely to so influence the street lighting effect of any given system that predictions based upon the inherent qualities of illuminants installed in a given way may be inapplicable in a particular case.

INSTALLATION CONDITIONS WHICH MAY INFLUENCE THE EFFICIENCY OF A STREET LIGHTING SYSTEM

The most desirable installation arrangements for lamps having given inherent qualities depend not only upon the extraneous conditions referred to above, but also upon many of the following factors:

Spacing

The distance between lamps and irregularities in such spacing, if made necessary or desirable by local conditions, are matters that are obviously of first importance to secure not only the expected general effect, but a proper distribution of the light.

Location

Whether the lamps are located over the middle of the streets, or along the curbs, and if the latter, whether all are on one side of the street or staggered on the two sides, is a question upon which the effectiveness of the street lighting system frequently depends in no small measure.

Height

The most desirable height for lamps has been the subject of much experimentation, and it has been repeatedly shown that improper selection of height for any given system is likely to interfere materially with its efficacy. It is a far more important element than usually appreciated and becomes particularly so with the high candle-power units which are now being introduced. The most advantageous height depends also upon the spacing employed.

Accessories (Globes, Reflectors, etc.)

The design and use of proper accessories to lamps is now receiving wide attention for interior lighting, and is beginning to receive some of the attention which it merits for exterior lighting also. The progress of illuminating engineering is rapidly making apparent the dependence of the efficacy of a street lighting system upon the use of the proper density and shape of the globes, design of reflectors and other accessories.

INHERENT QUALITIES OF ILLUMINANTS WHICH MAY BE MORE OR LESS IMPORTANT, DEPENDING UPON EXTRANEOUS CONDITIONS AND INSTALLATION CONDITIONS

Intensity

The question of the size or candle-power of the illuminant is one of the fundamental questions involved in the problem. Phases not to be neglected are the maintenance of initial candle-power or flux throughout the life of the illuminant or of its perishable part. The choice of a basis of measurement and comparison is also very important. Various pronouncements on this subject have been made in favor of (a) mean spherical candle-power or total flux of light, (b) mean lower hemispherical candle-power or flux in lower hemisphere, and (c) candle-power or illumination intensity at certain distances from the lamp at an angle approximating 10 to 20 degrees below the horizontal.

Light Distribution Characteristics

The most desirable distribution is so obviously dependent upon height, spacing and location, and any distribution may be so readily modified by the use of suitable accessories, the choice of which depends so largely upon the extraneous conditions, that it would be futile in this brief discussion to even outline the complications of this one aspect of the problem.

Steadiness

Unsteadiness, always to be deplored, becomes more disadvantageous as the spacing between illuminants is increased, and as a disadvantage in an illuminant, it must, therefore, be counted as of varying importance.

Glare

Glare in the objective sense is to some extent a property of an illuminant. However, its dependence upon installation conditions is almost absolute.

Color

Depending largely on the character of the street, the choice of color resolves itself into one involving physiological and esthetic considerations.

In view of the large influence which extraneous and installation conditions exercise upon the choice of illuminants, it is apparent that any method of evaluating illuminants for street lighting service which ignores these elements of the problem cannot be applicable to all cases.

INHERENT QUALITIES OF A STREET LIGHTING SYSTEM WHICH MAY BE OF GREATER OF LESS VALUE, DEPENDING UPON EXTRANEOUS CONDITIONS

Intensity

The intensity of illumination required in a system of street lighting is also something which is largely controlled and determined by the local conditions and hence is to some extent a matter of opinion. There is also diversity of view in regard to the proper basis of measurement and comparison. Various authorities have favored (a) average vertical illumination intensity measured on a plane five feet above the street level, (b) average normal illumination intensity measured similarly, (c) normal illumination intensity measured 200 to 300 feet from the lamp, (d) average illumination intensity measured in a plane five feet above the ground upon a surface inclined at an angle of 45 degrees to the vertical ray, (e) average horizontal illumination intensity measured upon the street surface.

Distribution

In streets of certain character it is desired to have building fronts well lighted, while in other streets it is desirable to concentrate as large a percentage of the light as possible directly upon the street surface. The distribution of the illumination in any street system must always be largely dependent upon extraneous conditions, such as the character of the street.

The foregoing review of the more usual complications which are met in considering the question of the equivalency of illumination of different street lighting systems will suffice to place before the membership the considerations which have influenced the committee to refrain at this time from endeavoring to report authoritative values for various available illuminants and illuminating systems for street lighting and from making a definite report to the Association recommending a particular method of comparing or studying such systems of lighting. It is doubtful if any general pronouncement can be made to serve satisfactorily as a basis of decision for all available street lighting systems as applied to all possible conditions of streets and installations, but before this question can be decided it is the opinion of the committee that much investigation and research work must be carried out along broad lines.

CONCLUSIONS

It must be admitted that there has been a lamentable lack of clearness and definiteness in the usual street lighting contract, often leaving the producer and the consumer equally in the dark as to their reciprocal obligations. The provision formerly so general in these contracts that the company was to supply simply a "lamp of 2000-cp" has given place to at least a specification of the energy to be delivered to the lamp or to the arc, and if it was not considered desirable to prescribe the specific type of lamp or to define the electrical constants which the lamp must have (leaving it open to supply an alternative illuminant), this fact was indicated by requiring the substitute to be of "equivalent illuminating value."

It is unfortunate that many contracts are so worded as to be a serious impediment to progress, practically prohibiting the adoption of new illuminants as the art develops, unless a new contract be negotiated.

It is, of course, desirable in the interest of the municipality and of the operating company, that improvements be introduced as soon as practicable after they have become commercially available, having regard, of course, to the existing investment (on which it may or may not have been possible to earn a sufficient return to make it practicable to supersede the old plant) and the cost of making the necessary changes. This is a question of give and take, in which there should be a reasonable and fair distribution, between the parties in interest, of the advantages to be gained, having regard to all the conditions. In many cases the progress in the art has made it possible to give a notable increase in the light with a material reduction in power consumption; but this reduction in cost of current is often largely offset, sometimes equalled by and in some cases more than balanced by increased cost of carbons and trimming, or by other operating conditions, resulting possibly in somewhat increased operating cost and fixed charges, but with materially increased illumination.

It is in the proper allowances to be made, pro and con, and the equitable evaluation and distribution of these advantages and burdens that controversy is apt to arise.

The progressive electric light company, desirous of dealing fairly with the public and giving it the advantages of progress in the art and of new developments as promptly as practicable, should find an appreciation by the municipality of its progressive spirit and a willingness to pay a fair and reasonable price for good and efficient service.

The committee has felt that many of the companies stood in need of assistance and advice in shaping their policy where a modification in their city street lighting contracts was contemplated, or where a change to one of the newer types of lamps was being considered.

As an aid to the consideration of the problems arising in making such proposed changes, it may be of interest to note the opinions which the Courts and State Utility Commissions have expressed in a number of cases which have come before them and which may serve to indicate the technical and economic features which they have emphasized.

To this end your committee has prepared, appearing as Appendix 1 of this report, a careful review of the Colorado Springs controversy, presenting as impartial a statement as possible of the points at issue, of the evidence adduced and of the findings of the Court.

A similar review, appearing as Appendix II, has been prepared of the recent most interesting and important decision of the Wisconsin Railway Commission in the Waupaca case. As the investigation contains a general review of the whole situation, a rather extended abstract has been prepared for reference.

As Appendix III and IV, respectively, appear short digests of the Whitewater and Sheboygan cases, both heard by the Wisconsin Railway Commission, and involving questions of interest to companies which have similar problems before them.

The abstracts in these two cases are condensed from the Commission reports and they cover only such matters as are of interest in connection with the work of this committee, eliminating the other features of the respective complaints and decisions.

As Appendix V there appears, practically in full, a decision of the Board of Gas and Electric Light Commissioners of Massachusetts in a case entitled "Plymouth Electric Petition," which contains matter bearing upon the subject of this Committee's Report, although referring largely to incandescent street lights.

In Appendix VI, there appears a list of cases which have been adjudicated by the Courts or have been passed upon by Public Utility Commissions, and in which the issues involved are such as come reasonably within the scope of the subject referred to your committee.

The Committee desires to express its thanks to the Wisconsin Railroad Commission and the Board of Gas and Electric Light Commissioners of Massachusetts for courtesies in connection with the publication of the abstracts from their reports.

The Colorado Springs digest was supplied through the courtesy of a member of the Committee who was also one of the experts in the case and the abstract of the Waupaca Case was prepared by one of the Advisory Committee.

Your committee feels that it can be of assistance to any of the member companies of this Association which may be considering a change in the type of street illuminant, but which are in doubt as to the fair and reasonable equivalency that they ought to provide under the conditions of their existing or under a new city lighting contract; or to member companies which, having made such a change, with or without a specific agreement with the city authorities, covering the conditions and basis under which the change was made, are in controversy with the municipality regarding such substitution. The committee would be glad to be helpful to companies which are having difficulties of this kind, and if they have any questions on which they would like to obtain the advice of the committee, they should feel free to communicate with it for such assistance as it may be able to give.

Respectfully submitted,

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APPENDIX I

THE COLORADO SPRINGS LIGHTING CONTROVERSY

ABSTRACT OF THE FACTS, THE ISSUES AND THE AWARD

The Facts in the Case

This controversy arose between the City of Colorado Springs and the Pike's Peak Hydro-Electric Company, over the interpretation of a clause in a city ordinance under which the company through its agent, the Colorado Springs Electric Company, was supplying arc lights for the City service. This ordinance was of date September 8, 1898, and the lights to be furnished were "of standard 2000-cp each." The Pike's Peak Hydro-Electric Company was unable to complete the construction of its works and assume the responsibilities of this contract until February, 1905. In the interim the City proceeded with its lighting under temporary contracts, first with El Paso Electric Company with lamps which "are commercially known as arc lamps of 2000-cp," and later with the Colorado Springs Electric Company under a contract calling for the lamps ordinarily known as "6.6-ampere, enclosed, arc lamps of the series alternating system."

When in February, 1905, the Pike's Peak Hydro-Electric Company assumed its franchise of 1898, it continued to employ these last mentioned lamps instead of those called for under its franchise. Disputes regarding this franchise having arisen, the City Council early in 1906 called for a report and opinion from the City Attorney, who reported on March 22, 1906, that the Pike's Peak Electric Company had never furnished or offered to furnish to the City any electric light of 2000-cp, and under this advice the city refused to pay the lighting bills after June 1, 1906, and the matter in dispute was eventually referred to arbitration.

The real inwardness of the whole matter seems to have been as follows: The franchise of 1898, known as the Jackson Franchise, had granted the right to use the city water supply for a hydro-electric plant for the supply of Colorado Springs. In return for this valuable franchise and privilege the grantees agreed to furnish arc lights of the kind specified for $5.50 per month each burning from sunset to sunrise, to give the City free five such arc lights, and 200 16-cp incandescent lamps, and 50 hp of electric power. It also assumed this franchise for the term of 25 years, with the proviso that at the expiration of this period the plant for supplying electric light to the grantor should revert to and become the property of the City of Colorado Springs. This provision of the franchise was successfully evaded by the Pike's Peak Hydro-Electric Company, which became possessed of the franchise, through the device of building no plant or pole lines within the jurisdiction of the City of Colorado Springs, but furnishing the City lighting through an intermediary distributing company, which was under no obligations whatever to the City.

Statement of this fact is necessary to make it clear why the City, which had regularly been lighted with the 6.6-ampere, alternating-current series lamps by the ad interim contractor, held rigidly to the terms of the early franchise when it came to deal with the owners of this franchise who had thus escaped from part of its obligations.

Under the Colorado Statutes, providing that civil cases of controversy may be decided by arbitration, the Board of Arbitrators has practically in the matter at issue the full authority of a regularly constituted court and the award when made has substantially the weight of a judicial decision and may be filed with the clerk of the District Court as basis of a judgment for which an execution may be duly issued. An agreement of arbitration was duly executed by the City and by the Company, and the Board of Arbitrators, consisting of Prof. L. G. Carpenter, Mr. E. L. Elliott and Mr. Henry Floy, met February 1, 1907, and proceeded with the hearing.

The Issues

Initially the City took the attitude that "arc lights of standard 2000-cp" meant precisely what the face of the words implied, and that the awards should be based on the ratio of the candle-power actually furnished the City to 2000-cp. As the tests on the street showed the lamps furnished to be actually in the vicinity of 300 candle-power, the City demanded a rebate of nearly $17,000 on the $20,000 which had actually been paid on account of lighting before the controversy reached an acute stage. The company held, on the contrary, that the lamps were never expected to be of 2000 actual candle-power and that in point of fact the lamps furnished were the full equivalent for illuminating purposes of the lamps commercially known as 2000-cp. It also plead equitable estoppel in that the City had virtually accepted the light furnished as satisfactory under the franchise of 1898, and hence could not later protest. A further claim by the City was that the lamps actually furnished were not operated to their full power, a claim which was met by the admission that while for a certain period this might have been the case, as soon as the company's attention was called to the deficit the lamps were operated above power and had thereafter been so continuously operated in good faith.

The concrete issues as they finally took form for the decision of the arbitrators were as follows:

1 Does the phrase "arc lights of standard 2000-cp each" mean an arc lamp giving 2000 actual candle-power, or if not what was the generally accepted meaning at the date of the contract?

2 Do the arc lights which the company has furnished, when operated under normal conditions, come within the meaning of the phrase "arc lights of standard 2000-cp"?

3 If the lamps furnished by the company when operated under

normal conditions have not fulfilled the requirements of the phrase "arc lights of standard 2000-cp," what is the extent of the overcharge, measured in dollars and cents, due to such deficiency?

4 Was the service which the company actually furnished from the lamps such as might reasonably be expected, and if not what was the overcharge, expressed in dollars and cents, due to deficient service?

5 Was the City estopped from claiming any refund?

The first two of these issues have to do directly with the interpretation of the franchise with respect to the lamps which should have been furnished under it, and those which were actually furnished by the company. The third and fourth issues have to do respectively with the measure of such insufficiency as might be found, first, with respect to the 6.6-ampere alternating-current lamps as normally operated, and second, with respect to these lamps as they were actually operated. The fifth question was a purely legal one with respect to the acts of the City in accepting service with the lights in controversy.

The following witnesses were heard with respect to the formal and technical issues. In behalf of the City, Alton D. Adams, J. R. Armstrong, Louis Bell, K. M. McMillan, W. H. McIntyre, Louis B. Marks, Charles P. Matthews, Van E. Rouse, John C. Shedd, William Strieby, George A. Taff; and for the Company, E. P. Dillon, C. W. Humphrey, J. C. Lawler, W. D'Arcy Ryan, R. F. Schuchardt, George A. Taff, G. B. Tripp, and the hearings and testimony extended over eight days.

The Decision on the Points at Issue

1 All the expert witnesses being in substantial agreement with regard to this issue, it was held that the term "arc lights of standard 2000-cp each" could refer only to a direct constant-current series, open arc lamp, taking not less than 9.6 amperes and consuming approximately 450 watts at the arc, and, this being the arc commercially known as 2000-cp, it was unanimously agreed that the phrase 2000-cp in this connection had long ceased to have any quantitive meaning, but was merely a commercial term attached to the lamps already referred to.

2 The expert witnesses again being in substantial agreement it was held that the 6.6-ampere series alternating-current lamps operated under normal conditions did not comply with the requirements of the contract in form or in fact.

3 The interpretation of this issue required a decision as to how far the 6.6 series alternating-current lamps when operated under normal conditions failed of meeting the substantial requirements called for under the contract. In other words how far does the 6.6-ampere series alternating-current lamp fail of equivalency for the purpose of its use with the 9.6-ampere, direct-current, open arc lamp of the contract? The arbitrators in considering this matter recognized that the two lamps should not be compared on the question of gross candle-power alone, but that they should be considered as well with respect to suitability to their purpose and various operating qualities which favored at some points the one

form, at other points the other. As to the lack of equivalency there was no dispute among the various experts, who differed only in their estimate of how great the difference might be. All the witnesses, however, were substantially agreed upon one point, which was seized upon by the arbitrators as a sound basis for judgment, that is that an alternating-current series arc lamp operated at 7.5 amperes and appropriate voltage would have been a substantial equivalent, for the purposes of its use, of the lamp of the disputed contract of 1898.

The difference in light-giving power between this 7.5-ampere lamp and the 6.6 alternating-current series lamp operated under normal conditions was found by the experts without serious differences of opinion to be about 20 per cent and this amount was taken by the arbitrators as the deficit of the 6.6 alternating-current series lamps from full equivalency to the 9.6 direct-current open arc.

4 This issue involved one specially important consideration, to wit, was the company responsible for such deficit in lighting power as might result from defective service? It was held by the arbitrators that such was the case. Pursuant to this ruling the watts supplied to the lamps as measured by the company, less a deduction factor determined from the wattage as measured in the streets, was taken as the average wattage of the lamps, and the candle-power at this wattage was taken at the value determined by tests made to find the relation between the candle-power and wattage within the range covered by the lamps in question. The candle-power thus found gave a means of determining the deficiency or excess of service as compared with the normal lamp, and this factor was used in the final determination of the award.

5 It was in effect held that the City was not estopped by any of its acts from claiming a refund on account of the failure of the company to meet the obligations of its contract. The arbitrators, however, regarded the amount of the refund as modifiable by the relations which had existed between the parties to the controversy. The City had used and paid for the lamps without protest for fifteen months, and during this period the company had furnished a light inferior to what was required by the contract. Consequently the arbitrators held that both parties had been negligent during this period, and therefore for this period divided between them the refund due on account of the actual insufficiency found in the company's lights. In effect, therefore, the Board of Arbitration held that the 6.6 alternating-current series arcs in normal operation were not the equivalent of the direct-current, 9.6-ampere, series open arcs for the purpose of their use, but failed thereof by substantially 20 per cent; that the company was responsible for damages accruing from not keeping its lamps burning at normal brilliancy and that such damages should be determined on the basis of the deficit in candle-power so far as it could be ascertained between lamps as furnished and those normally operated; and finally, that the failure of the City immediately to protest against the change did not estop its recovery of damages, but implicitly involved a certain responsibility in the matter which was given due weight in the assessment of damages.

The Award

Pursuant to the decisions already mentioned, followed the award of the arbitrators. Two periods of service were considered. The first was from February, 1905, to June, 1906, during which period the bills of the lighting company had been paid by the City. During this period the refund to the City was figured on the following basis: assuming from the weight of the evidence that the lamps in use when normally operated failed by 20 per cent of being equivalent to the lamps of the contract, half of the corresponding 20 per cent refund was charged against the City and half against the company, for the reasons already stated. To this 10 per cent refund due the City from the company was added a further refund for damages accruing from failure to keep the lamps at their normal brilliancy. This was ascertained as follows: The company's record of the wattage supplied to the lamps, after due allowance for line losses, was taken as the basis from which lamp performance should be reckoned. From this wattage was subtracted 6.25 per cent, the difference between the station reckoning of the energy and that actually measured in the street. From the energy per lamp thus determined the ratio of the candle-power produced to that pertaining to the normal operation of the lamp was obtained by reference to curves of performance showing from experiments the effect in candle-power of variations in wattage through the range of wattage under investigation. During this period, taken month by month, the lights were found to have ranged from 75.4 to 91.3 per cent of the normal candle-power. For the corresponding deficits pro rata allowances were subtracted from the price. On account of total deficit of light during this period the City was credited, including interest, with the sum of $5,131.46.

Second, for the period from June 1, 1906, to February 1, 1907, the company was adjudged to have erred knowingly and against the protest of the City, and hence was required to pay for the full 20 per cent deficit in light as between the light used and light of the contract, again modified by the actual candle-power as determined from the wattage records in terms of the candle-power of the lamps at normal operation. During the latter part of this period, from the beginning of September on, the company had raised the wattage on its lamps by increasing the amperes to 7 and its voltage to between 78 and 80. During this period, therefore, the corresponding candle-power of the lamps ran above normal by amounts varying, month by month, from 7.6 to 15.2 per cent. Hence on the whole the correction for actual candle-power of the lamps as compared to that of normal operation was slightly in favor of the company. The total reduction in bills ordered during this second period was $2,056.43, and including interest on payments withheld and the legal fees of the arbitrators, which were charged to the losing party, the total award to the City was $7,123.67.

From the standpoint of precedent the two important features of the award were the decision that the 6.6 alternating-current series lamp normally operated failed by 20 per cent of meeting the requirements of the contract calling for 2000-cp lamps, and that the company was liable on a pro rata candle-power basis for failure to hold its lamps at their normal rating. The decision is also important as holding that the term 2000-cp is not subject to its literal interpretation, and that while a city by acquiescence may not lose by estoppel its right to recover, its acquiescence may as a matter of equity have a bearing on the amount of damages awarded.

APPENDIX II

RAILROAD COMMISSION OF WISCONSIN

In re JOINT APPLICATION OF THE WAUPACA ELECTRIC LIGHT AND RAILWAY COMPANY AND THE CITY OF WAUPACA TO THE EFFECT THAT THE RAILROAD COMMISSION ACT AS ARBITRATOR IN CERTAIN MATTERS PERTAINING TO STREET LIGHTING IN THE CITY OF WAUPACA

Abstract of Decision, February 21, 1912

This case involves the lighting of the streets of the City of Waupaca, Wisconsin, and is a controversy between the Waupaca Electric Light and Railway Company, petitioner, and the City of Waupaca, Wisconsin, respondent.

It arises out of the substitution by the company of 6.6-ampere alternating-current series enclosed arc lamps, for 9.6-ampere direct-current open arc lamps, which had been operated for years on contracts calling for "2000-cp arc lights," in somewhat the same form as was usual at the time the earlier contracts were drawn up.

The decision takes into consideration the multifarious phases always surrounding cases of this character, including the equivalency of the two systems, from the standpoint of actual candle-power emitted under normal and abnormal operation; the steadiness of the light emitted; the distribution curve of the units; the various physiological and psychological phases bearing on the general satisfactory results obtained from the illumination; the legal phases pertaining to this situation, and the local condition surrounding this particular case—bringing out especially the financial circumstances under which the service was rendered by the company.

The investigation and decision, utilizing as they do the results already accomplished by other authorities, such as the committees of the National Electric Light Association, the experts and scientists who have investigated this phase of illuminating engineering, and the decisions already rendered by the courts and other civic bodies (especially in the Colorado Springs case), embrace a thorough resume of the present status of matters of this character, and owing to the extensive experimental investigations by the engineering staff of the Commission add greatly to the not too plentiful fund of information available on this subject.

The decision follows the general trend of the deliberations of former bodies in like cases, up to the point where the local conditions involve the financial fact that the company, when utilizing the old system, was not sufficiently compensated for its service, and that the new conditions, therefore, represent a more equitable financial arrangement. The decision then gives considerable weight to this fact, and—as the company has in the meantime raised the current in the arc lamps to 7 amperes, and as the Commission recognizes the difficulties involved in placing a monetary value on the various more or less intangible advantages and disadvantages between the two systems—it finally holds that the system of the company as at present operated, is for the purposes of the present contract a virtual and reasonable equivalent of the former system.

"It is the finding of the Commission therefore, as the result of the investigation undertaken upon this joint application, that the City of Waupaca, under the circumstances, has not suffered damage by reason of the substitution of the alternating-current enclosed lamps for the direct-current open lamps as to entitle it to claim any reduction from the contract price of the street lighting service furnished it by the Waupaca Electric Light and Railway Company, from the time of the change in the installation of street lamps up to the present time."

The following gives some historical data bearing on the case:

"Certain bills for services rendered by the petitioner in lighting the streets of Waupaca during the several months of 1910 were disallowed by the Common Council of the respondent city, whereupon the Waupaca Electric Light and Railway Company appealed from these disallowances in the Circuit Court of Waupaca County, and formal pleadings were ordered therein by the Court.

"The proceedings were withdrawn from the Court through stipulations by the parties concerned and were brought before the Commission for decision. It was agreed in the stipulations that all differences now existing between the parties as to the efficiency and commercial value of the street lights under the present contract for street lighting, dated March 31, 1903, and the respective liability of the City and Company under the contract, be left unreservedly to the Railroad Commission to investigate, settle and adjust."

The original contract, signed in 1886, provided for the use of "ten Brush arc lights, or some other arc lights as good or better than the Brush, of 2000 candle-power;" rate per lamps was $60 per year; schedule, eight hours per night or about 2920 hours per year; life of the contract was not stated.

A second contract was signed in 1898; lamps to be "twenty-two 2000-cp arc lights;" rate per lamp $76.36 per year; schedule to be all night; life of contract to be five years.

The company substituted for all night burning Adams arc lamps with double carbons.

The third and present contract, signed about March 31, 1903, provided for "not less than twenty-seven 2000-cp arc lights;" rate $6.36 per lamp per month, payable monthly; schedule dusk to dawn; life of contract, ten years.

The company operated its open arc lamps for about eighteen months after signing this contract, then changed as stated below.

Lights were furnished and paid for up to January, 1910; the February and March, 1910, bills were disallowed by the City and then came the appeals as outlined above. The City contends "that at the time the contract was entered into the petitioner was furnishing, and for a long time prior thereto had furnished, for the purpose of lighting the streets, pursuant to a contract with the City then about to expire, open arc lamps of 2000 nominal candle-power; that the actual candle-power of these lamps was less than 2000, which term was nominal rating adopted by electricians, and that the lamps were mutually accepted as fulfilling the contract. The respondent City further claims that, disregarding the terms of the contract, and without obtaining the consent of the respondent, the petitioner substituted for the lamps then in use, enclosed arc lamps of less actual candle-power and of a nominal rating among electricians generally of about 1200 candle-power; that both actual and nominal candle-powers of this lamp were about three-fifths of the actual and nominal candle-power of the open arc lamps so displaced; that the petitioner . . . misrepresented that the enclosed arc lamps were of a nominal rating of 2000 candle-power and were of equal candle-power, size and efficiency to the open arc lamps . . . ; that relying upon the false statements . . . of the petitioner and believing them to be true, the City paid for the lamps . . . until about the first day of February, 1910, since when, the respondent (City) has refused to accept the enclosed lamps as complying with the contract and has so notified the petitioner."

The Company claims that the old lamps in use in 1903 had been in use since 1886 and were of an obsolete type (open direct-current arcs operated at about 9 to 9.3 amperes), and therefore in August, 1904, the change was made. These old lamps had never been operated above an hourly output per lamp of 450 to 465 watt-hours; that in about 1903 cities began to change to enclosed alternating-current arcs and finding it desirable the company selected this lamp and hung a sample for inspection and criticism for six weeks. This sample was a multiple, enclosed arc in lieu of a series enclosed type. The enclosed alternating-current lamps were and have been until March, 1910, operated at 6.6 amperes, and 73 volts.

Having met with passive approval this type was substituted at an expense to the Company of $5,000. *The City acquiesced in the change* and paid all bills until February, 1910, and "by reason of the foregoing facts the respondent City is now estopped to deny that the lights are not in conformity with the contract and is estopped from refusing to pay for lights furnished under the contract. All efforts to obtain an approval of the new lamps met with merely passive acquiescence."

The cost of operating the arc lamps and its relation to total cost of operation and the relative income from the street lights was computed by the Commission, after some difficulty, due to incomplete records. After thorough consideration of details, by their usual painstaking methods, the Commission found the total operating expenses of the arc lamps, inclusive of interest, to be $88.98, or $97.88 per lamp per year, according to two different methods of estimating.

The gross revenue per lamp is $78.35, or $78.57. Which determination is the more reliable it is difficult to conclude. However, it is quite apparent that, whichever value is more exact, the street lighting system will be found to earn very little in the way of interest above all other operating expenses.

By making some allowances for abnormal accounts, the Commission finds, "that the street lighting investment is earning from somewhat less than 4 per cent to somewhat less than 6 per cent in the way of interest on the cost of reproduction. Just what this plant should earn is difficult to decide in view of the conditions under which it operates." It operates a lighting, power, and one-car railway system from a combination steam and hydro-electric plant."

The points relating to the quality of service are whether the alternating-current enclosed arcs as installed in Waupaca in 1904 and as operated until March, 1910, were a fair substitute for the open direct-current, 9.6-ampere arc, and if not, what damage, if any, the City has sustained from such substitution; whether the lamps as operated since March 1, 1910, have been a fair substitute for open direct-current, 9.6-ampere arc lamps, and, if not, what adjustment for the difference will be fair to both parties.

"These questions involve matters which were touched upon in the case of the City of Sheboygan, Wisconsin, *vs.* Sheboygan Railway and Electric Company, matters which of recent years have received much investigation and discussion, but which are not as yet so definitely settled that we are furnished with a basis for opinion without further comment or without further investigation."

"In passing upon these matters consideration has been given to whatever of importance has been found to relate thereto and to extensive investigations by the Commission staff."

In speaking of a brief prepared for the City by Mr. A. D. Adams, the Commission points out that relative mean hemispherical candle-power, based on authorities, and on estimates of the energy consumed by the Waupaca arcs, is all that is considered in this brief, which gives the relative worth of the Waupaca lights as 35.64 per cent of contract rate from August, 1904, to March, 1910, and 37.80 per cent since March, 1910.

"Such an analysis, while affording some indication of the relative luminous efficiency—that is, total light production—of these light sources, leaves unconsidered some of the essential features of street illumination."

The Colorado Springs decision and National Electric Light Association Committee Reports are then reviewed and the fact pointed out that the 6.6-ampere, alternating-current lamp is not considered by this decision and report a fair and full equivalent for the 9.6-ampere, direct-current, arc lamp. The difference, as found at Colorado Springs, was about 20 per cent, which was about the same difference existing between 6.6-ampere alternating-current and 7.5-ampere alternating-current lamps.

After a detailed review of the National Electric Light Association Committee Reports and the citation of their X values, the petitioner company "claims that, because the determination of the X values was, within certain limits, a more or less arbitrary matter and because the Committee found it necessary to make big steps in dividing the lamps into definite classes, the division is not an exact measure of one lamp in turn with another. It is further claimed that while the illumination at 250 feet, which corresponds to the X value of 3.5, is about 0.0031 foot-candles; the illumination that the 6.6-ampere, alternating-current, enclosed lamp gives at 250 feet is 0.0038 to 0.0039 foot-candles, and that, therefore, this lamp lacks only a few per cent of being in the same class with the 9.6-ampere, direct-current, open lamp, which was designated by the Committee by an X value of 4 which corresponds to 0.0041 foot-candles at 250 feet from the lamp. "When the alternating-current lamp is operated at 7 amperes it is claimed by the petitioner company that the illumination at 250 feet is increased about in proportion to the change of current from 6.6 to 7 amperes and that the lamp operated at 7 amperes would therefore be in the class with the class having an X value of 4." Some analyses of the Committee's reports are made to indicate certain flexibility to the listing of the various lamps in the reports.

While comparison of illumination on a plane of reference may be the most effective comparison involving the intensity of illumination, various reasons for not confining the comparison to undirectional measurements, for the purpose of this case, are pointed out. The method of using the light, the height of lamps, distribution curve of lamp, etc., are cited as factors. "For this reason it appears that a comparison of light sources for street lighting purposes by the amount of illumination that is produced at a certain distance from the lamp leaves important factors unconsidered."

Tests were made by the Commission staff of the illumination "at several distances from the lamp and of other factors which have an important bearing on the situation."

Two distinct characteristics may be attributed to a light source, namely, its efficiency as a light producer and its efficiency as a light distributor. By the term "efficiency as a light producer" is not meant the relation between the energy supplied to the illuminant and the energy of the emanating light, though this no doubt would be the more exact definition, but the relation between the number of light units produced and the energy units supplied is implied by the term. By efficiency of distribution is usually meant the effectiveness of the distribution of the existing light for useful purposes. Upon the first basis, efficiency as light producers, it would seem, all artificial light sources for illuminating purposes may be freely and directly compared, as this comparison involves only the amount of light produced and amount of energy consumed, both of which can be determined with reasonable accuracy. Upon the basis of efficiency as light distributors, comparison cannot be made without considerable qualification, as various factors outside of the lamp itself affect the results and must be considered when they are not eliminated.

Efficiency as a light producer and efficiency as a light distributor, therefore, demanded investigation, one dependent only on energy and total light flux, and the other upon various qualifying factors outside of the lamp itself.

"Determination of light-producing efficiency is chiefly a matter of laboratory investigation, and the Commission utilizes such work as is already done by authorities.

"The relative efficiency as light distributors, or, more properly, the relative adaptability for specific illuminating purposes, may be determined with more or less degree of accuracy from laboratory tests, but the performance under such conditions is so likely to be somewhat different from that under actual operating conditions, that when possible, it is advisable to determine the character of the distribution of light under service conditions. For this purpose, various methods are often followed using portable photometers, luminometers, etc. A portable photometer was employed by the Commission staff for all field measurements of light, or illumination."

"As there appears to be no unanimity of opinion, up to the present time, as to exactly how or what measurements of illumination should be made for a comparison of street lights, it was necessary for the staff to reach conclusions independently as to what should be undertaken in this regard to furnish a basis for an equitable decision. The recommendations of the N. E. L. A. Committee, as already referred to, specify that the methods of illumination should be made in a plane normal to the light rays from the lamp at the test point. Others maintain that the measurements should be made on a horizontal plane, which is usually about parallel with the street surface. Still others advocate measurements of the illumination on a vertical plane. Each method has its own advantages and disadvantages."

"For the purpose of this case, much of the work has followed the method of using the vertical test plane, but it is not claimed that the use of this plane is in all respects superior to the use of others. It has the advantage that the same relative position of the test plane is maintained at all points of measurements with reference to the axis of street and objects along this axis; that the most favorable condition for measurement is secured where the illumination is low and therefore where the measurement is usually least accurate; that light from the opposite lamp does not affect the measurement when the test position is midway between lamps; and that if reflection from the street surface is material this reflection has its effect on the test plate near the lamp as well as at a considerable distance. It has the disadvantage that, as the test plane approaches or recedes from the lamp, the plane changes its angle with respect to the incident light."

A further discussion of the relative advantages of the vertical, normal and horizontal planes of reference for the purpose of the measurement of illumination in the street was presented.

Then followed the investigation into the operation of the Waupaca arc lamps. No record of the average current was available before March, 1910, except the Bristol recording ammeter tests made by the City, which showed that the current of the arc circuits was very closely 6.6 amperes. After the complaint was entered, about March, 1910, this current was raised to 7 amperes.

Certain wattage tests were made on the Waupaca street lights, for the City, by Mr. J. R. Cravath, on December 9, 1910, showing the average wattage of thirteen lamps tested to be 415, the minimum being 350 and the maximum 505.

Candle-power tests were also made at the same time by the City under certain conditions, the results of which follow:

"City Hall lamp, test plate 41 feet distant and 4 feet below lamp:

	Candle-Power
Minimum observed	133
Maximum observed	336
Average of 10 readings	197

"Union and Main Street lamp, test plate 40 feet distant and 4 feet below lamp:

	Candle-Power
Minimum observed	78
Maximum observed	135
Average of 13 readings	113

"Fulton and Main Street lamp, test plate 40 feet distance and 4 feet below lamps:

	Candle-Power
Minimum observed	118
Maximum observed	216
Average of 13 readings	140

"It is admitted by the respondent's witness that these tests of candle-power are insufficient in number and duration to furnish conclusive evidence as to the performance of the lamps. The wattage tests cover, it would seem, a sufficient proportion of the lamps in use to give some indication of the performance of the lamps in this respect, at that time. From these tests it is seen that the Waupaca lamps even when operated at 7 amperes were, on December 9, 1910, supplied with less energy than the rated consumption of such lamps normally operated at 6.6 amperes."

The company then overhauled and readjusted its lamps, after which the average wattage of 30 lamps, operated at 7 amperes and tested by the company's electrician, was 472, the minimum being 432 and the maximum 486.

From the foregoing it is quite evident that the adjustment of the arc lamps was so made that, although the current flowing was only 7 amperes, the energy consumption of the arc lamps was, on an average, not much less than the wattage rating of 7.5-ampere arc lamps of the same kind.

The lamps were all tested again under the direction of the applicant's expert witness, Mr. W. D'A. Ryan.

SUMMARY—WAUPACA STREET LIGHTING TEST

	Total No. lamps	Av. 100'	Foot 150'	Candles 250'	Volts at terminals	Amp. in line	Watts at terminals
By Schenectady Calibration ..	30	.016	.0073	.0031	86	7	491
By Waupaca Calibration ..	30	.018	.0095	.0040	86	7	491
Mean	30	.017	.0084	.0036	86	7	491

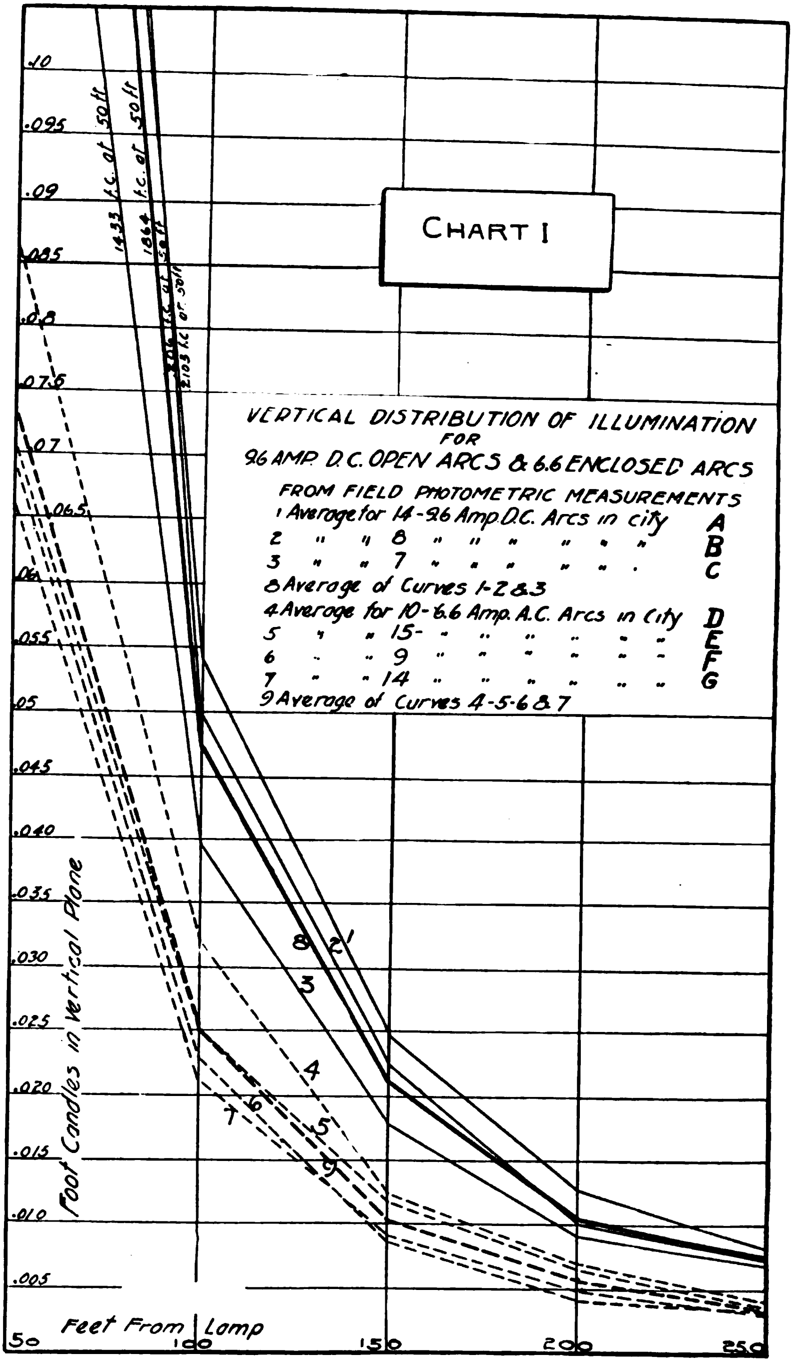
During April, 1911, each lamp used for municipal street lighting in Waupaca was carefully tested by members of the Commission staff. In order to compare the 6.6-ampere, alternating-current, enclosed lamp and the lamp as operated in Waupaca at 7 amperes with the so-called "2000-cp arc," the inspectors conducted tests on several systems of 6.6-ampere, alternating-current enclosed and 9.6-ampere, direct-current open arcs in other cities.

In making a comparison for this case, between the illuminating qualities of 6.6-ampere, alternating-current enclosed and 9.6-ampere, direct-current open arcs, as types of street illuminants, it was recognized that a comparison of average conditions as represented by a random selection of systems in operation would not necessarily serve as a fair comparative measure of the quality of the respective lamps, but that reasonable care must be taken that comparison be made of each type operating under normal conditions. The Commission was confronted at the very outset with the difficulty of obtaining tests upon open lamps operating under what may be termed first-class conditions for, as is well known, this form of arc is for one reason or another now being rapidly displaced in this country by other types; and, since those which still remain will for the most part be soon displaced, proper maintenance has under these circumstances been frequently neglected.

"Examination of the form of the light distribution from the 9.6-ampere, open arc lamps as given by such authorities as Mr. W. D'A. Ryan and Prof. C. P. Matthews, as well as the data of our own staff, indicate quite conclusively that lamps of this kind should be placed much higher above the street surface than the 6.6-ampere or 7.5-ampere alternating-current enclosed arcs in order to most effectively utilize the light produced. The first agreement as to street lighting between the applicant and respondent in 1886 specified that the open arc lamps should be placed on poles not less than 40 feet in height. While it may be argued that specification is made of the height of poles to be used but not of the height of the lamp above the street, the logical deduction seems to be that it was at that time believed that such arcs should be placed about 40 feet high. Since these facts of the matter seem to bear out this opinion and because we are attempting to determine the illumination of this lamp under normal condition, it seems proper to give at least some consideration to the resultant illumination when the lamp is placed at this height.

"The inspectors have therefore determined the difference between the intensity of illumination at various points along the street for the lamps at heights as found and for the lamps as assumed at a height of 40 feet. It was found that so raising the lamp, decreases the intensity of illumination near the light source but increases it beyond 50 to 90 feet from the lamp, thereby producing more uniform distribution of illumination.

"While for reasons already given the Commission met with little difficulty in concluding that a comparison of the radiants by ratios of illumination produced at a certain distance from the lamps is hardly sufficient as a measure of their relative merits, the problem still remained of deciding upon a proper comparison when we have for consideration fairly well established curves of distribution for intensities at various

CHART I
VERTICAL DISTRIBUTION OF ILLUMINATION
FOR
9.6 AMP. D.C. OPEN ARCS & 6.6 ENCLOSED ARCS
FROM FIELD PHOTOMETRIC MEASUREMENTS
1 Average for 14-9.6 Amp. D.C. Arcs in city A
2 " " 8 " " " " " " B
3 " " 7 " " " " " " C
8 Average of Curves 1-2 & 3
4 Average for 10-6.6 Amp. A.C. Arcs in City D
5 " " 15- " " " " " " E
6 " " 9 " " " " " " F
7 " " 14 " " " " " " G
9 Average of Curves 4-5-6 & 7
1.433 f.c. at 50 ft
1.864 f.c. at 50 ft
2.06 f.c. at 50 ft
2.103 f.c. at 50 ft
.10
.095
.09
.085
.08
.075
.07
.065
.06
.055
.05
.045
.040
.035
.030
.025
.020
.015
.010
.005
Foot Candles in Vertical Plane
Feet From Lamp
50
100
150
200
250
1
2
8
3
4
5
6
7
9

points along the street. The first method that naturally suggested itself was to determine the simple average of ratios of the illumination measured at the several points.

"Street lighting, at least in a liberal service, is not merely a matter of strip lighting, as might be at first supposed, but it involves, as well, *the illumination of adjacent yards and buildings.* The importance of this factor must not be neglected, as it is a material aid in rendering visible persons and objects upon and along the streets. Since this is true, it appears that areas rather than mere distances are involved in the lighting problem and that the measurements made at considerable distance represent, in general, larger *areas lighted* and greater light flux from the lamps than do those which are made within relatively short distances. Consequently it seems that, if a comparison of the intensity of illumination at various points along the street is to serve as a measure of the relative merits of the lamps, the useful light at considerable distance should receive more weight than that near the lamp, and that the relative weight should be somewhat in proportion to the area lighted.

"One of the most essential features of good street lighting, when not involving a special problem, is *uniform distribution of light.* Nearly every one is acquainted with the well-known physiological phenomenon which occurs as one passes from a dimly lighted room to one which is brightly lighted, or vice versa. Although vision is at first quite distinct, passage into a room having a considerable difference of illumination is usually accompanied by inability to see distinctly, if at all, until the eyes have adjusted themselves to the changed condition. It has often been observed that it is difficult to see from brightly lighted spots, or past brilliant lights into more obscure places which, in themselves, seem illumination."

A discussion of the uniformity of distribution of daylight and moonlight and of the variations from very high intensities in daylight to very low intensities in moonlight then follows, with the conclusion that "for ordinary streets and highways by night, the average person is satisfied with the illumination of the unclouded full moon," and that "with uniform and well-diffused light, vision is quite clear at very low values of illumination."

"These facts lead to the conclusion that when there is little to choose between various light sources, insofar as the quantity of light emanating to the street surface or other reference plane is concerned, that source is in general best which most evenly distributes the radiating light.

"There is still another important factor, namely the *steadiness of light,* which is impossible of such scientific measurement as will offer a suitable basis of comparison. *Unsteadiness* of the light sources resulting in flickering and flaring has a deleterious effect upon vision. It requires little presentation of facts to show that in this respect the alternating-current enclosed arcs are superior to the direct-current open arcs, as manufactured in this country, even when the latter are operating under good conditions. However, just what is the difference in value due to a difference in steadiness, in the case of arcs which in other respects are equal, is a more difficult matter to determine.

"It has been found by the inspectors of the Commission that the wattage of the direct-current open arc lamp fluctuates about 6.5 times as much as that of the alternating-current enclosed arc. But other factors, such as wind, rain, snow, insects and complexity of station regulating equipment also have their effects upon the steadiness of burning and render a comparison difficult.

"What difference due to physiological and psychological effects of different intensities of illumination exists in the relative commercial value of light sources of the same general characteristics as regards color of light, uniformity of distribution and steadiness of emissivity, has not as yet been satisfactorily determined." The phenomena accompanying the physiological effect of adaptation have been "established in only such very general terms that their relation to the commercial value of various street lights cannot now be expressed in dollars and cents."

"The facts which have been brought forth by this investigation show quite clearly that the characteristics of the lamps involved in these proceedings must necessarily be judged both quantitatively and qualitatively. Concerning those characteristics which may be measured quantitatively, considerable data have been presented herein carrying out the fact that the illumination produced along the streets by the 9.6-ampere, direct-current, open arc lamp is about twice the amount produced by the 6.6-ampere, alternating-current enclosed arc. But regarding the relative merits of those factors which must be considered qualitatively, there is some divergence of opinion. Even among the experts of the Commission staff, opinions differ somewhat as to what extent the inferior quantity of light from the 6.6-ampere, alternating-current, enclosed arc lamp is balanced by superior steadiness and uniformity of distribution.

"In support of the opinion that this lamp is a fair substitute for the 9.6-ampere, direct-current, open arc, the following statement has been submitted by one of the Commission experts."

"It is undoubtedly true that the primary factors bringing about the abandonment of the 9.6-ampere, direct-current, open arc and the adoption of the 6.6-ampere, alternating-current enclosed type of arc lamp were the advantage in operation, the principal one of which is that the enclosed type requires trimming or replacement of the carbons about once a week as against once a day. This, with other attendant advantages from the station equipment and distribution standpoints, involves a considerable saving in operating cost per lamp. Just how far the interests of the public were considered in developing and using the enclosed type of lamp is difficult to determine. The change involved a sacrifice in light-emitting power per lamp of about 50 per cent, and it is a debated question whether, from the customers' standpoint, the enclosed arc type has compensating advantages sufficient to justify this development.

"It is only during the past few years that there has been developed and made available a type of portable photometric equipment suitable for the measurement of street illumination and candle-power. By the use of this instrument much important information concerning street illumination has been obtained; but it has been brought out with striking emphasis that the actual usefulness of a system of street illumination is not capable of exact measurement by means of such equipment. This is due to the fact that there are certain qualities of illumination which cannot be determined by photometric means, qualities which determine in marked degree the useful efficiency of the light furnished. While the intensity of illumination can be determined by the photometer, the influence of flicker, non-uniformity and glare on the usefulness of this light are not capable of measurement.

"With a lack of methods of measurement for qualities which go to make up useful lighting efficiency, judgment must necessarily play a part in arriving at an estimate. Even the interpretation of luminous intensity, that quality which can be measured by the photometer, an uncertain factor enters; *i. e.*, the adaptability of the eye. The photometers tell us that daylight illumination is over one hundred thousand times the intensity of bright moonlight, yet this enormous ratio does not represent the relative seeing ability, conferred by these two type of illumination on account of the change which the eye itself undergoes in adapting itself to the amount of light available. As the intensity of illumination increases the percentage of light made use of by the eye decreases. With the comparatively low intensities involved when comparing these types of street lamps, the question of adaptability of the eye does not play as important a part, but still it is a factor to be considered. On an assumption then, of equality of factors, other than intensity of illumination, it does not appear probable that the relative intrinsic value of two street lights is directly proportional to the intensity of light, because of eye adaptability; while the 6.6-ampere, alternating-current, enclosed arc lamp has one-half the light-emitting power of the 9.6-ampere, open arc, its relative usefulness is something more than 50 per cent. Just how much it is impossible to determine on account of the incomplete knowledge concerning adaptability. If we could add to this figure, which is above 50 per cent, another figure representing the percentage advantage of the enclosed over the open arc, due to greater uniformity of distribution, another figure representing the advantage of less glare, and another for less interruption of service, we would have a resultant figure which would represent the relative service value of the two types of lamp. Whether the sum total is 100 per cent or less or more is a matter largely of judgment of experts and authorities on illumination and covers a considerable range, some holding that the old type of light is superior, others that there is approximate equality, and others that the enclosed type is the more useful. With this divergence of expert opinion, the judgment of the public at large assumes an importance; and it appears that the judgment of the public is that the street lighting service which is given to-day is not inferior to that given twenty years ago.

"An important factor to be considered is that the direct-current open arc lamp has become, or is rapidly becoming, obsolete in this country;

that while economy and simplicity have had much to do with the introduction of the new types of lamps, it is almost inconceivable that in this development the interests of the public would or could have been sacrificed, in view of the fact that the science of illumination was developing and that fraud could not escape detection. In results of litigation and in various publications relative to street lighting systems the public has been informed on this subject, but such information does not appear to have retarded the change from the older type of lamp.

"In view of the consideration expressed in the foregoing pages it appears to the writer that the 6.6-ampere, alternating-current, enclosed arc lamp is a fair equivalent of the older type 9.6-ampere, direct-current, open arc lamp, and that if there is any inferiority in effective illuminating service rendered by the former type, the amount is so uncertain and of such insignificance as to be impossible of measurement, and not capable of numerical statement.

"Although as stated above and as noted elsewhere herein, various advantageous features effecting the cost of operation were primary factors in bringing about the introduction of the enclosed arc, the fact that economy of operation resulted does not lead to the conclusion that the service was equivalent. It does, however, have an important bearing upon the rate to which the utility is entitled, the number of lamps for which the city can afford to pay, and consequently upon the kind of system which should be selected.

"The relative number of 6.6, 7.0 and 7.5-ampere, alternating-current, enclosed arcs in use does not indicate what the public generally considered a fair equivalent of the open direct-current arc, because of the advantage to the public of reduced rates which followed the introduction of the enclosed arc.

"It seems to be established that what the 7.5-ampere alternating-current, enclosed arc lacks in intensity of illumination it just about makes up in those elements which cannot be properly evaluated, and that, where prejudice does not exist, due to difference in operating costs or for other reasons not based on service itself, the 7.5-ampere, alternating-current, enclosed arc ordinarily replaces with reasonable satisfaction the 9.6-ampere, direct-current, open arc as a street illuminant.

"Various comparisons made by the staff appear to show that the 6.6-ampere, alternating-current, enclosed arc lamp is about 18 to 20 per cent inferior to the 7.5-ampere arc as a street illuminant. It therefore follows that the position of the 6.6-ampere, alternating-current, enclosed arc is about the same amount below that of the 9.6-ampere, direct-current, open arc when the latter and the 7.5-ampere, alternating-current, enclosed arc are considered as fair equivalents. Similar comparisons show that the enclosed arc lamps as operated at 7.0 amperes during the inspector's tests are about 10 per cent inferior to the 9.6-ampere, direct-current open arc as street illuminants.

"The general looseness of the terms of the contract involved and the failure of the parties concerned to come to an understanding as to the meaning of these terms of the contract which bear upon the service to be rendered" and some features of a street lighting contract to be given consideration are then discussed, embracing references to the National Electric Light Association Committee Reports.

"During recent years much has been done by the illuminating profession in its effort to clear up the matter of indefiniteness of street lighting contracts. From a consideration of such progress as has been made in this respect it is believed advisable to hold the recommendations of the committees not as final, but as a progress report in the transition from contracts rating lamps only on power consumed to the form which may later be recognized as in general the best.

"Inadequacy of various street lighting contracts, it seems, has been due not only to weakness in expressing the terms of the agreement, but also to failure to recognize the mutual responsibility of both interested parties for the form of the special equipment employed. Since, under most conditions of street lighting, the cost of energy produced is one important element of the total cost and the cost of operating the special apparatus for converting electrical energy into radiant light is another, and since, for these reasons, neither units of energy supplied nor of illumination produced properly measure the final cost of producing light, it appears that the unit which most successfully combines both elements will most adequately measure the payment for the services delivered.

"In concluding this discussion of the essential elements of street lighting contracts, it may be said that because the rates to be paid cannot be equitably based upon the amount of illumination and because of the lack of flexibility in changing from one kind of lighting system to another, for which the utility can be held no more responsible than the city, the preliminary investigation leading to a selection of the system to be employed should cover both the relative illuminating merits and the cost of operation for the various systems under consideration. As the proper illumination of streets is a matter of great importance and as contracts therefore usually involve the expenditure of considerable sums of money, sufficient professional skill, proportionate of course to the importance of the undertaking, should ordinarily be engaged in the preliminary investigation by the parties to the contract, to insure the adequacy of the system selected to meet the needs of the community.

"While we have been enabled from the various facts presented to arrive at some idea of the difference in the quality of illumination produced by the several lamps, attendant circumstances in this case render impossible a decision placing a money value upon the damage to the respondent in accord with the difference in the illuminating values of the arcs.

"It is the contention of the attorneys for the respondents that these proceedings do not involve a determination of a reasonable rate of compensation for the street arc lighting now or heretofore furnished to the respondent city and that were this the sole question at issue it should result in a reduction of price to the City from the price now being paid. The argument of the respondent confines itself almost entirely to the law in the case. On the other hand, it is argued by the applicant that these proceedings do not involve technicalities of law, but the determination of all the questions in dispute between the respective parties.

"One of the important questions to be disposed of upon this view of the case, relates to the legal rights of the City of Waupaca, which rights the electric light company claims the city has lost because of its conduct subsequent to the change in the street lighting system.

"The Waupaca Electric Light and Railway Company contends that, regardless of the question of fact as to whether damage has resulted to the city from the change in the installation of street lights, the city is precluded, by estoppel or waiver, from setting up any claim for damages, by reason of its acquiescence in the use of the new lights and its payment of all bills presented to it from 1904 to January, 1910. Upon this point of estoppel or waiver, the City of Waupaca sets up the facts that in paying the first six bills of the electric light company after the change in installation, it made a written reservation of its rights under the contract; that the city was not acquainted with the facts as to the comparative efficiency of the old and new lamps and was not to be held to a knowledge of such facts; and that the city took no formal action looking to a ratification or a waiver of its rights, and the doctrine of estoppel is not to be invoked against a municipal corporation by reason of its mere silence.

"The equitable doctrine of estoppel, by which a party is precluded from denying that which his words, actions, or mere silence have caused another person to believe, when a denial would cause injury to that person, is not applied to municipal corporations with the same strictness as to individuals. While cities are sometimes held to be estopped by their acts, as to matters not clearly beyond their powers, this is true only in very strong cases. The doctrine of the Wisconsin Supreme Court upon this point is stated in Ashland *vs.* Chicago and North Western Railroad Company, 105 Wis., 398, as follows:

"Testimony to establish an estoppel against the City must be clear, distinct, and of such a character as to amount to a fraud, to permit it to claim otherwise. The rule is never applied as freely against the public as against private persons. It is only when some affirmative action has been taken or when there has been some great negligence or delay with relation to some matter upon which the parties have a right to rely, that the Court will be authorized to apply the rule, so as to prevent manifest injustice or wrong. Such injustice or wrong must be firmly established by fact and circumstances that leave no room for doubt or controversy. See also Davis *vs.* City of Appleton, 109 Wis., 580.

"It seems clear from a review of the facts of the present case, which have been set forth in the first pages of this opinion, that no estoppel can be found if the rule quoted above is to be applied. If the city in the present case were attempting to claim the contract was annulled by the company's acts, and to escape all liability, it might well be argued that so unjust a claim should be met by the doctrine of estoppel. But all the city claims in this case is the amount of damages which may be justly due it by reason of the company's deficient performance of its contract. Not only is there a lack of such gross negligence as the Wisconsin rule of estoppel against municipalities requires, but it would seem that the city authorities were, at least at the outset, very careful to protect the city against estoppel, for they expressly reserved all rights of the city under its contract with the company. Nor is there to be found in this case such a reliance on the city's supposed acquiescence in the light furnished, to the detriment of the company, as entitles the latter to set up an estoppel."

Citations of legal decisions follow, bearing on doctrine of estoppel and waiver.

"The result of this examination into the legal situation involved in the present case is that no waiver of the right to damages, if any existed, can fairly be deduced from the acts or the attitude of the City of Waupaca. In many of the cases cited, the conduct of the cities much more strongly suggested a waiver than did the conduct of the City of Waupaca in this case, yet the courts have been very reluctant to find in any of these instances a waiver of the right to damages. It would hardly be consistent with the trend of judicial authority to determine upon the facts of the present case that the city's right to damages, if any such right exists, has been lost. This conclusion is, of course, entirely independent of the question whether the facts of this case actually show the existence of damage."

Comparison of operating cost of open and enclosed arcs is then referred to as follows by the Commission:

"We do not believe that either the petitioner or the respondent contends that the cost of operating the 6.6-ampere, alternating-current enclosed arc system is as great as for the 9.6-ampere, direct-current, open arc. In fact, it seems to be generally admitted that the cost of operating the latter is considerably more per lamp than the cost of operating the former, and that this was one of the most vital reasons for the general abandonment of the open arcs, in this country, upon the commercial introduction of the enclosed type. Examination of the petitioner's investment, income and operating expenses shows that the net earnings of the entire business or of street lighting as a part thereof, are hardly sufficient even under the present method of street lighting to furnish what would ordinarily be considered adequate, much less attractive, return upon the investment involved.

"It is clear, therefore, that were the Waupaca Electric Light and Railway Company furnishing 9.6-ampere, direct-current, open arcs, the operating expenses would be increased by at least $10 per lamp per year above the costs determined for the year ending June 30, 1910, and that the applicant would not be earning its operating expenses, to say nothing of a fair return for interest and profits. In this respect, if the cost of service in 1903 was about the same as it now is, it seems that the contract entered into at that time was not entirely a reasonable one as between both parties thereto, but that street lighting was a burden to the business, if the business as a whole is entitled to adequate return."

The Commission's general conclusions are:

"Judging from the tests of the Waupaca lamps by our staff in April, 1911, after the lamps had been overhauled and readjusted during the preceding January and February, the deficiency for which the applicant is responsible is so small as to come within the limits of a reasonable difference of judgment based on all the facts in the case. And since the light from these lamps as they are now operated is at most only a point or two in desirability below that of the 7.5-ampere, alternating-current, enclosed and the 9.6-ampere, direct-current, open arcs and in view of other facts, it does not appear that there can be at this time an equitable reduction of the rate paid for this service. For the period from March, 1910, when the current was raised from 6.6 to 7.0 amperes, to January, 1911, when the lamps were readjusted, it is probable that the service was a little poorer than it was found to be when tested—in April, 1911, and probably somewhat better than it was prior to March, 1910. The service may have been close to either limit or it may have been anywhere between. For a period prior to March, 1910, the Waupaca alternating-current lamps were operated at about 6.6 amperes. There is no claim that the quality of service was better than this. There is some indication that at times the service may have been worse, but upon this point there is also no conclusive evidence. When the difference between the quality of service of 6.6-ampere, alternating-current, enclosed arcs and 9.6 direct-current, open arcs normally operated, is properly adjusted, the deficiency for which the applicant might be responsible is so small and of such character that we are unable to see how it can be made the subject of monetary damages, particularly in view of the fact, that the rating by the city for the services involved in barely sufficient to compensate the applicant for the present alternating-current enclosed lamps, and considerably below the cost of the 9.6-ampere, direct-current open lamps.

"The Commission has proceeded in this investigation upon the assumption that not only the legal rights of the practise under the law of contracts but all the considerations of equity and justice which may be found to exist in the case are to be considered in reaching the final result.

"It is the finding of the Commission, therefore, as the result of the investigation undertaken upon this joint application, that the City of Waupaca under the circumstances has not suffered such damage by reason of the substitution of the alternating-current enclosed lamps for the direct-current open lamps, as to entitle it to claim any reduction from the contract price of the street lighting service furnished it by the Waupaca Electric Light and Railway Company from the time of the change in the installation of street lamps up to the present time."

THE RAILROAD COMMISSION OF WISCONSIN

Commissioners
J. H. Roemer
Halford Erickson
David Harlowe

Dated, February 21, 1912.

APPENDIX III

RAILROAD COMMISSION OI WISCONSIN

CITY OF WHITEWATER
vs.
WHITEWATER ELECTRIC LIGHT COMPANY

Abstract of Decision of December 16, 1910

The City of Whitewater filed a complaint with the Commission stating:

> (2) "That said Whitewater Electric Light Company has not in the past, does not, and is not now furnishing arc electric lamps of the standard illuminating power of 2000 candles each with 432 watts of electrical energy, as agreed and required by the terms of said contract; and that said company has not in the past, does not, and is not now lighting and keeping and maintaining said arc lamps lighted and illuminated to the full limit of said 2000 candle-power with 432 watts measured at each lamp as aforesaid and as required by said contract and during the times required by said contract."

An analysis of the proceedings, the decision and the order in this case indicates that while the sole matter in dispute was the character of the street lighting service rendered the City of Whitewater by the Whitewater Electric Light Company, the return on the value of the plant devoted exclusively to the arc lighting system was deemed by the Commission a most essential factor for consideration in determining the equity of the city's complaint.

The greater part of the testimony offered at the hearing related to the valuation of the property as made by the Commission, from which valuation was apportioned definite percentage values for the commercial system and for that part of it devoted exclusively to the arc lighting system.

The detail of this valuation is unimportant until the summary is considered in conjunction with the tabulations entering into the valuation of the plant, the operating expenses and the average costs per year per lamp for the years of 1909 and 1910.

The Commission stated in this connection:

> "* * * It appears from all data available that $90 per lamp is the lowest amount at which the respondent can fulfill the terms of its contract with the City of Whitewater to furnish arc lighting to the city and secure a proper return upon the property used. * * *".

The Commission quoted the following extract from a report by the engineering staff of the Commission, regarding the rated candle-power of arc lamps:

> "* * * No governmental body has, to our knowledge, defined or rated arc lamps, and street lighting still remains unstandardized, much to the confusion of parties to public lighting contracts, as well as to the illuminating profession. It may be pointed out, however, that it is generally accepted by illuminating engineers that the term '2000 candle-power' is a nominal rating and that the original arc to which it was

applied was the 9.6-ampere, direct-current, open arc; that the 7.5-ampere enclosed arc is a fair substitute for the same; and that the 6.6-ampere alternating-current, enclosed arc is one which receives a nominal rating of 1200 candle-power.

The Commission pointed out very definitely that it considered the contract as lacking in definiteness and, referring to the report of the engineering staff of the Commission relative to the unstandardized situation existing in street lighting, stated:

"* * * The extracts quoted above are sufficient to show that the term '2000 candle-power' in the contract between the parties to this case is merely a nominal rating and does not represent the actual amount of light given, and that the provision of the contract providing for the city deducting a certain sum in case lamps do not reach the stated illuminating power is practically impossible of enforcement. * * *"

Eliminating, therefore, the contention of the city relative to the term "2000 candle-power," the engineering staff of the Commission, who conducted the investigation in its entirety, decided that in view of the provisions of the contract the only test which would indicate whether the lamps complied with the specifications would be a wattage test. The following excerpt of the tests is of value, as when considered with the operating expenses per lamp they form the basis of the decision and order filed in this case.

"* * * The tests made September 21 and 22, 1910, by the Commission inspectors showed all the lamps to be operating below standard wattage by amounts varying from 17 to 100 watts for the 14 lamps tested, the standard being 432 watts per lamp. A difference of 0.4 amperes in the operating current of the two circuits was also found.

"The correction of the current error of the station instruments and a readjustment of most of the lamps would be necessary to obtain standard wattage on all the lamps. The company is equipped with adequate facilities for doing this."

The Commission agree that keeping the energy at the prescribed wattage will not alone be a measure of the actual illuminating power under service conditions, and that "it appears that the term standard illuminating power of 2000 candles is a term which is practically meaningless * * *."

Although the cost to the company ($90) seems to be in excess of the amount paid by the city ($80), the Commission explains that the company when its business as a whole is considered, is not so badly off. The Commission also calls attention to the fact that the costs were prepared upon the assumption that the lamps were maintained in accordance with the contract specifications as to wattage. The income account of the company is shown in justification of this statement and the Commission concludes as follows:

"* * * While its net earnings can by no means be regarded as unreasonably high, they would still seem to be high enough so that, from this point of view, there are no good reasons why the services should be kept at a lower than reasonable standard of efficiency. In fact, a full consideration of these and of the remaining facts that have been presented herein has led us to the conclusion that it is only just and reasonable that the respondent should be required to bring about such improvements in its equipment and methods of operation that it can furnish and maintain the proper wattage, and that its services in other respects be placed and maintained on a basis that is reasonably adequate under the circumstances.

"It is therefore ordered, that the respondent in this case, the Whitewater Electric Light Company, make such readjustments in its lamps and other equipment that it will supply and maintain 432 watts of electrical energy at each of its arc lamps during the time these lamps are in actual use and that its service in other respects be brought up to standards that are reasonable and adequate."

APPENDIX IV

RAILROAD COMMISSION OF WISCONSIN

CITY OF SHEBOYGAN
vs.
SHEBOYGAN RAILWAY AND ELECTRIC COMPANY

Abstract of Decision of February 3, 1911

This case involves the rate and the quality of street lighting service for the City of Sheboygan, the complaint of the City specifying that the lighting company had "failed to furnish light of as high a candle-power as was provided for in the contract; that it otherwise failed to give proper care and attention to its street lighting system," and that while willing to pay a reasonable compensation the City is unwilling to pay at the rate of $74 per year per lamp of "full 2000 candle-power" all-night service as fixed in the former contract and praying the Commission to fix a reasonable rate for such service.

The Commission decided that it was necessary to determine the value of the property, expenses, etc., allotted to the street lighting system in order to fix a fair return for the service rendered. The methods of this form of valuation have been followed by the Commission under similar conditions in other cases, are well known and need not be detailed here.

The average expense per lamp as determined by the Commission was $68 yearly, or $6.00 less than the price paid under the old contract. This cost was based "upon the operation of the street lighting property as it exists at present, producing a quality of street lighting service such as the company now furnishes" and on other factors the result of the necessarily arbitrary form of valuation of the Commission.

In considering the quality of service it must be understood that in the contract the lighting company limited itself to furnishing to the City arc lamps of "full 2000 candle-power." No other specifications appear in the contract and under the last previous contract the lighting company furnished, without objection on the part of the City, 7.5-ampere, alternating current, enclosed arc lamps in fulfillment of its part of the agreement.

It has not been attempted by the Commission to define the exact meaning of the term "full 2000 candle-power," although some ideas have been presented relative to the matter from which it is fair to assume that the Commission has a thorough understanding of the rating thus made use of in the older forms of street lighting specifications. In dismissing from their consideration the question of the 2000 candle-power rating the Commission outlined the following procedure as applicable to the case before them.

"The matters which most concern us and to which we shall now turn our attention are whether or not the lamps owned and operated by the Sheboygan Railway and Electric Company are operating under normal conditions, whether or not these lamps are such as to operate satisfactorily upon a system of this kind, whether or not the City's complaint is true that the street lighting system does not receive proper care and attention, and if these may be answered in the negative, what changes are necessary to produce normal operating conditions, and what will be the effect of such changes upon the cost of operation.

In order to determine these points, only one course at present presents itself as open to our purpose, namely: a comparison of observations of the performance of the equipment with observations, either by the Commission staff or others, of the performance of other equipments of the same kind. The purpose, then, of the observations which will follow, is not to determine the actual illuminating power of a '2000 candle-power' arc, nor to devise a means for specifying street illuminating in contracts. These two problems do not properly enter into this case. The purpose, as has been suggested, is to determine the relative normal and actual performances of this system. That methods differing somewhat from those followed by the Commission inspectors might have been used, it is reasonable to suppose."

The Commission then details in tabulations and shows graphically the results of a very exhaustive series of tests made under conditions comparable with those of Sheboygan. The tests were made: (1) on a wattage basis; (2) candle-power measurements at 45 degrees below the horizontal; (3) average illumination falling on a vertical plane 50 feet from the lamp; (4) and under similar conditions at 250 feet from the light source; (5) a comparison of the mean illumination over a considerable area.

In addition to the above, an investigation of the station apparatus was also conducted.

The Commission reports that the tests indicated the efficiency of the street lighting system was several points lower than what should reasonably be expected. The following paragraphs are those of the Commission in concluding the case:

"* * * Owing to the peculiar nature of these shortcomings in the lighting efficiency and the uncertainties that exist with respect to their duration and to the injuries, if any, that were thereby inflicted upon the City, it is exceedingly difficult to place a money value upon them. In fact, in the absence of regular tests during the entire period involved, it is almost impossible to obtain safe bases for such purposes. In view of these and other facts we have not attempted to fix a specific value thereon for the purposes of this case.

From these considerations of the facts, it appears to us that under present conditions a rate of $68 per street arc per year would be a reasonable rate for the arc lighting involved in these proceedings, and that the respondent should immediately take such steps as may be necessary to bring the service up to a point where it can be regarded as reasonably adequate.

It is therefore ordered, that the rate for the street lighting service in Sheboygan shall not exceed $68 per arc lamp per year; and

It is further ordered that this service be so improved as to become reasonably adequate."

APPENDIX V

THE COMMONWEALTH OF MASSACHUSETTS

IN BOARD OF GAS AND ELECTRIC LIGHT COMMISSIONERS

July 28, 1911.

PLYMOUTH ELECTRIC PETITION

This is a complaint in writing under section 34 of chapter 121 of the Revised Laws, by the selectmen of the town of Plymouth, of the quality and price of electricity supplied in said Plymouth by the Plymouth Electric Light Company.

After due notice a public hearing thereon, as required by law, was held in Plymouth, at which the petitioners and company were represented by counsel. The complaint, so far as it concerns quality and the price for commercial lighting and power, was waived by the selectmen at the hearing, which was confined to the question of the price of street lights only.

Prior to August, 1907, the company was supplying for street lighting about 330 incandescent carbon filament lamps and 8 nominal 1200 candle-power arcs. Three of the incandescents were 32 candle-power and the others 25 candle-power, and all burned upon a midnight moonlight schedule. Of the arc lamps, one burned all night and the others upon the same schedule as the incandescents. In that month the company of its own accord, but with the approval of the selectmen, began the gradual replacement of these incandescent lamps with 40 candle-power tungsten filament lamps. The displacement of the carbon filament lamp was gradual over the system, and no definite record has been preserved of the number of lamps of each kind in use at any particular date. In the later portion of this period of change the arc lamps were replaced by clusters of five incandescents, and a limited number of 200 candle-power tungsten incandescent lamps were installed. All the arc and carbon filament lamps have thus been replaced by tungsten incandescents.

Before and since the above changes in the lamps the company charged and the town has paid $21 a year for the 32 candle, $20 for the 25 candle incandescent and $125 a year for the all-night arc, and $85 a year each for those burning until midnight.

Prior to the annual town meeting in 1909 the company offered, provided a five-year contract were made, to supply upon moon schedule the incandescent lights until midnight at $18 a year, and all night at $21 a year, with a uniform price of $105 per year for the arcs, all the incandescents to be 40 candle-power tungstens. The selectmen recommended that the all-night proposition be accepted, and that all the arcs be replaced by incandescents, either singly or in clusters of five for each arc lamp. No action, however, was taken by the town beyond referring the question of street lighting to a committee consisting of the selectmen and five other citizens, to report at a future meeting. At the annual town meeting in 1910 the selectmen were authorized to make a contract, for a term not longer than five years, for lighting the streets, on such terms and conditions as they may think proper, but were also instructed to enter a complaint with the Board of Gas and Electric Light Commissioners as to the quality and price of electricity furnished by the company.

All the arc lamps having been displaced by clusters of five each, as already described, the lamps in actual use appear to be 336 40 candle-power 50-watt tungstens, 3 250-watt tungstens and 8 clusters of five 40 candle-power lamps each. All these burn upon a moonlight schedule until midnight, except 7 of the clusters, which burn all night. The lamps, however, are billed to the town in the same way as in August, 1907; that is to say, bills are made for 336 25 candle-power lamps at $20, three 32 candle-power at $21, seven arcs at $125 and one arc at $85 per year.

In August, 1907, the price for commercial lighting was 20 cents a kilowatt-hour, with discounts from 5 per cent upwards, according to the size of the bill. Prior to the petition in this case these prices had been reduced to a maximum rate of 18 cents with a sliding scale to 10 cents, according to the amount used monthly, and a discount of 10 to 20 per cent, according to the number of nights burned per week.

Under the scale of prices for commercial lighting the company received during the fiscal year ending June 30, 1910, for all electricity sold for this purpose, an average of but little more than 8 cents a kilowatt-hour. As the complaint relative to the commercial business was distinctly waived, these prices are mentioned only to aid in understanding the position and claim of the selectmen hereinafter stated, and it is not the purpose of the Board to endorse the company's present schedule of prices for light and power or to express any opinion with respect to it.

It was contended, in support of the complaint, that the price charged for the incandescent lamps, taking into account prices charged in other towns of the Commonwealth, is too high; that, irrespective of prices elsewhere for 25 candle-power carbon filament lamps, the price for tungsten lamps now in use should be less, because the latter, though of higher candle-power, consume less current than the former; and that, compared with the prices charged by the company to its other customers, the price for street lights is too high. In connection with the last proposition it was contended that the price for street lights should be based on the theoretical consumption of current by the lamp, either at the average rate charged for commercial lighting or at the average of all lighting, commercial and public, or upon the same schedule as commercial lighting, all the street lamps being regarded as the installation of a single commercial customer with an annual bill. On the other hand, the company contended that the candle-power is the true measure of the value to the town of the street lights, and a proper basis for the price. Neither party relied on any attempt to separate the company's investment and operating costs for the street lights, and to base the price upon these with a fair return upon such portion of its investment.

While evidence of prices charged in other communities for street lights is not without weight, it can seldom if ever be regarded as controlling. Its force is also greatly weakened by the fact that such comparisons must usually be made with prices charged for carbon filament lamps, or originally made for such lamps and continued even where, as is now so common, tungsten lamps have been substituted; and by the further fact that, until very recently, in fixing prices for street lights no consistent, rational theory has been followed, either by the companies or by the public authorities, save a purpose on both sides to make the best trade possible. Whatever force may have formerly attached to the candle-power as an arbiter of rates, it must under present business methods and the development of the art be supplanted by a consideration of the energy supplied.

It must be conceded that, based upon cost alone, the street lamps of the tungsten type and of the same or even of a somewhat higher candle-power can be supplied at a less price than the carbon filament lamps, until recently exclusively used, because of their lower cost to maintain and operate; but it is by no means clear that such reduction in cost is proportional to the difference in the amount of energy consumed in the lamp. Neither those investment, distribution and management costs which necessarily enter into and constitute a substantial share of the total, nor, for that matter, certain of the costs of producing the electricity, seem to be in any degree reduced by the substitution of tungsten for carbon filament lamps. Coal and possibly repairs and maintenance with some minor supplies at the station, appear to be the only items of street lighting cost of which it may be safely claimed that they vary according to the quantities of energy made and used. The actual saving to the company in these items, due to the less amount of energy required for the tungsten as compared with the carbon street lamps in Plymouth, based upon the figures of the fiscal year ending June 30, 1910, appears to be somewhat less than $1.00 a year for each lamp, although the reduction in energy used in the lamp is more than 40 per cent. Indeed, the tendency of the introduction of tungsten lamps for both commercial and street lighting purposes is to increase the cost per unit, because of a reduction in the total units sold without any reduction in costs outside the generating station—a tendency which obviously can be checked and overcome to a large extent on the other hand by the general development of the business and by other factors of importance. However, unless the prices charged or offered for carbon filament lamps are assumed to be reasonable, the inquiry as to the amount of reduction justified by the substitution of tungstens offers no real solution to the problem as to what the town should in fairness pay.

The proposition that the price of street lights should be based strictly upon the amount of energy required to operate the lamps, and should be made upon the same or as advantageous terms as are offered to private consumers, is more fundamental.

Just why any more weight should be given to the suggestion of an average price received rather than any other price in the company's varied schedule was not fully explained. The average price, which is determined by dividing the total receipts from all customers by the total kilowatt-hours sold, is not, unless by chance merely, the price offered to any customer. It may be that no customer ever pays exactly that price, and it is difficult to see why, if the street lights are to be governed by the commercial schedule, that price rather than some other of the numerous prices which it contains should be adopted. That it is a very attractive proposition to the town is evident, because it would result in an exceptionally low price for the street lights, the average price received by the Plymouth Company for commercial lighting being lower than in most companies of its size in the State. It is important also, as a general proposition, because if applicable in Plymouth it is difficult to see why it might not be applicable to all other companies.

The Board is unable to agree with the contention that the current used in all of the lamps should be combined and treated as the energy supplied to a single consumer; in other words, that all the lamps should be taken together and considered as a single installation of a large consumer. It is quite true that the billing and collection costs are minimized under the conditions of street lighting supply and become those of a single customer, but the numerous and widely scattered installations, and the investment and maintenance charges incident thereto, which constitute by far the more important items of cost, give to each lamp or group of lamps many of the characteristics of an individual customer of small size, if the commercial scale of charging is to be applied.

If the rule were to be generally adopted of charging for these lights merely in proportion to the current used, the price for a lamp of relatively low candle-power and high wattage, like the carbon filament lamps in common use until recently in Plymouth, would be very much greater than for the relatively higher candle-power and low wattage tungsten lamps, although the latter are clearly of greater value to the public. It is equally clear that this method of charging would make the price for all-night lighting approximately double that for midnight lighting, a principle which no company has yet attempted to impose, and one which municipalities, it is safe to say, would be absolutely unwilling to adopt. Prosperous and well-managed companies have found all-night lighting profitable upon a wholly different basis, and municipalities have long been accustomed to pay proportionately less for all-night than for midnight lighting.

While these suggestions illustrate the difficulty of adopting, without qualification, the rule proposed by the town, yet the proposition that the basis of the charge for incandescent street lighting should be the commercial rate is an important one and entitled to great weight. With equal emphasis in other cases it has been urged that in fixing street lighting prices the Board should determine the fixed and variable costs for such service, and completely separate these costs from those of every other portion of the business. Strong reasons are found in support of both propositions. The Board in this case has found it neither necessary nor practicable to rely implicitly upon either, although giving to both, in connection with the other circumstances of the case, due weight in the solution of the problem in hand. The Board is nevertheless convinced that companies should more fully recognize the reasonableness of the claim by municipalities to have their street lamps supplied upon as advantageous terms, all things considered, as are offered to private customers, and believes that the same theories of commercial expediency which have been so persistently applied in making commercial lighting and power rates may, with no less fairness, be applied to the street lighting schedule. Street lighting may fairly be required to bear its reasonable proportion of all necessary costs, sharing such losses as may be unavoidably incident to the business as a whole, but its fair price is not necessarily determined upon the commercial rates, especially if these for any cause happen to be unreasonably low or high, nor upon special claims distinct from those of the entire volume of the business. The methods of determining public and private lighting prices in any case must be directed to a single end, namely, to determine what is a fair price, taking into consideration all the facts and circumstances involved in the case; but prices no more than dividends are governed by arbitrary or inflexible rule, nor are they wholly exempt from those business conditions and necessities which are dominant in every company. It is from this standpoint, recognizing the force of the town's contention, but as a conclusion from all the facts developed at the hearing, and in the subsequent examination of the company's affairs, that the Board has reached its recommendations.

* * * * * * * *

Following the principles suggested the Board considers the prices named in the following recommendations to be reasonable and fair for lamps of the type and candle-power now installed. The Board recommends:

That on and after the first day of August, 1911, the prices for street lights supplied by the Plymouth Electric Light Company for moonlight lighting, substantially as heretofore, shall not exceed the prices named in the following schedule, to wit:

For 50-watt 40 candle-power tungsten lamps burning until midnight, not more than $16 each per year.

For 50-watt 40 candle-power tungsten lamps burning all night, not more than $20 each per year.

For 250-watt 200 candle-power tungsten lamps, or their equivalent in clusters of five 50-watt 40 candle-power lamps, each burning until midnight, not more than $71 per year.

For 250-watt 200 candle-power tungsten lamps, or their equivalent in clusters of five 50-watt 40 candle-power lamps, each burning all night, not more than $89 per year.

For the Board,

FORREST E. BARKER,
Chairman.

APPENDIX VI

DIGEST OF REFERENCES TO COURT AND COMMISSION DECISIONS INVOLVING ISSUES RAISED IN CITY STREET LIGHTING CASES

On Illumination Values

National Electric Light Association's Committee on Street Lighting, 1907 and 1908 Reports.

Standard Specifications for Street Lighting

London Illuminating Engineer, Volume IV, 1911, pages 4, 301, 410, 504.

On Equivalency of Illumination

Colorado Springs Controversy, before Arbitrators at Colorado Springs, Colo.

On Rates and Quality of Service

City of Whitewater *vs.* Whitewater Electric Light Company, Railroad Commission of Wisconsin, No. U-87.
City of Sheboygan *vs.* Sheboygan Railway and Electric Company, Railroad Commission of Wisconsin, No. U-94.
Town of Plymouth *vs.* Plymouth Electric Light Company, Board of Gas and Electric Light Commissioners of Massachusetts, July 28, 1911.

On Estoppel

Ashland *vs.* Chicago and Northwestern Railroad Company, 105 Wis., 398.
Davis *vs.* City of Appleton, 109 Wis., 580.
16 Cyclopedia of Law and Procedure, 744.

On Doctrine of Waiver

Charley *vs.* Potthoff, 118 Wis., 258, 264.
Pabst Brewing Company *vs.* Milwaukee, 126 Wis., 110.
Smith *vs.* Burns Boiler Manufacturing Company, 132 Wis., 177.
Swedish-American National Bank *vs.* Koekernic, 136 Wis., 475.
Buffalo Barb-Wire Company *vs.* Philips, 67 Wis., 129, 132.
Waupaca Electric Light and Railway Company *vs.* Milwaukee Electric Railway and Light Company, 112 Wis., 469, 473.
Olsen *vs.* Mayor, 56 Wis., 551, 556.
Monroe Water Works Company *vs.* Monroe, 110 Wis., 11.
Sikes *vs.* City of St. Cloud, 60 Minn., 442.
Joplin Water Works Company *vs.* Joplin, 177 Mo., 496.
Wiley *vs.* Inhabitants of Athol, 150 Mass., 426.
Omaha Water Company *vs.* Omaha, 156 Federal Reporter, 922.
City of St. Charles *vs.* Stooky, 154 Fed., 722.

Brush Electric Light and Power Company *vs.* Montgomery, 114 Ala., 433.
Burlington Water Works Company *vs.* Burlington, 43 Kan., 725.
Lamar Water and Electric Light Company *vs.* Lamar, 140 Mo., 145.
Creston Water Works Company *vs.* Creston, 100 Ia., 687.
Marion Water Company *vs.* Marion, 121 Ia., 306.
Aurora Water Company *vs.* Aurora, 109 Mo., 540.
Central Electric Company *vs.* Street Lighting District, 71 New Jersey Law Report, 403.

On Officers' Salaries

State Journal Printing Company *vs.* Madison Gas and Electric Company, Fourth Wisconsin Railroad Commission Report, 501, 638.
Ross *et al. vs.* Burkhardt Milling and Electric Power Company, Fifth Wisconsin Railroad Commission Report, 139, 152.
Leominister Gas Light Company, before Board of Gas and Electric Commissioners of Massachusetts.

THE CHAIRMAN: I want to emphasize the importance of this report. I feel that we have had great good fortune in getting Mr. Lieb and the other distinguished men whom he was able to associate with himself in this work to go into the work as thoroughly as they did. Probably a large percentage of you gentlemen have experienced some of the difficulties which are always encountered in dealing with a board of aldermen or other representatives of the municipality to whom you offer suggestions for street illumination. They get into the position of viewing everything with suspicion and any movement to substitute one form of illumination for another is looked upon as an effort of the electric company to gain some advantage over the city. The arbitrary rating which prevailed as to the old open arc lamps was in its time something of an obstacle and will still be brought up by some city councils in communications, although it is pretty well understood that 2000 candle power rating is a nominal rating; but there are other objections which come up against the various illuminants and, as I have stated, the city's official position is always one of suspicion. With this report and the suggestion which has been made by Mr. Lieb that you submit your troubles to the committee, the members of this Association have a document which will be of inestimable value to them. In any such discussion the names which appear as members of this and the advisory committees cannot be ignored, as they are the names of men who are noted throughout the country for their familiarity with the subject they are dealing with, and who have an unchallengeable reputation for fairness and integrity. I believe this report is the most practical and useful, perhaps, of any report which has been submitted to the convention. [Applause.]

The next number on the program will be the report on the proposed constitutional amendments, Mr. H. H. Scott, New York City, on behalf of Mr. Frueauff, Chairman.

REPORT OF COMMITTEE ON CONSTITUTIONAL AMENDMENTS

Your Committee on Constitution and By-Laws, after a careful consideration of various suggestions referred to them, begs leave to submit the following proposed amendments to the Constitution, with the recommendation that they be offered in writing to the Association for action at the next annual meeting:

Article III, Section 5.—Amend to read as follows:

SECTION 5. Class D members shall be electricians, electrical or mechanical engineers, manufacturers, publishers, bankers and brokers, or others—corporations or individuals—who are directly or indirectly interested in advancing the use of electricity. They shall have all the privileges of Class A members except the right to vote, to hold office and to attend the executive sessions.

The purpose of this change is to enable bankers, brokers, or any others who are interested in advancing the use of electricity to become Class D members of the Association. It appears that there is a wide field for enlarging the size of this class of members and of enlisting a class who may prove of great value to the Association.

Article VII, Section 1.—Amend to read as follows:

SECTION 1. The annual dues of member companies (Class A) in cities and towns of less than 5000 population shall be $10.00; in cities and towns of 5000 and less than 10,000 shall be $15.00; in cities and towns of 10,000 and less than 25,000 shall be $20.00; in cities and towns of 25,000 or more shall be $25.00 plus 1/100 of 1 per cent of the gross earnings from the sale of electric current of the company for the preceding calendar year.

The last clause of the first paragraph of the present section is dropped in order that all companies in cities of over 25,000 shall pay in 1/100 of 1 per cent of their gross earnings without any reservation.

Article VII, Section 4.—Amend to read as follows:

SECTION 4. The annual dues of Class D members shall be $20.00. Each Class D member, however, shall pay to the treasurer of the Association $5.00 for each representative or guest enrolled under its name at the annual convention. The officers of the Association may invite annual subscriptions from Class D members upon some basis which shall seem fair in proportion to the business carried on by the Class D member with the central station companies, and any such subscriptions shall be in lieu of the $5.00 charged per representative or guest enrolled at the convention.

A sentence is added to the present section so as to permit and encourage subscriptions from Class D members who are highly benefited by their membership in the association and who may care to assist in the Association's work. While the committee looked with favor on a plan for dues based upon the volume of business transacted by the Class D members with the central station industry, we have recommended the above as a plan to be followed for the present.

Insert a new section to be known as Article VII, Section 7, to read as follows:

ARTICLE VII.

SECTION 7. Class A members or Class D members who may elect to collect for the Association the dues of its Class B or Class E members upon an instalment basis may do so in accordance with a plan of payment approved by the officers of the Association. In the event a Class B or Class E member leaves the employ of the member company, the member company shall so notify the Association and shall be responsible only for the pro rata proportion of the dues of the member up to the date of such notice.

This section is added to enable the member companies to assist their Class B or Class E members by arranging for the paying of their dues over a period of months and to aid the Secretary's office in keeping a record of members paying upon the instalment plan.

Article XVI, Section 1—Amend to read as follows:

ARTICLE XVI.

SECTION 1. Upon certification to the Treasurer of the National Electric Light Association by the executive officers of any Geographic Section stating the membership of such Section who have paid dues for the full calendar year, and upon approval of the Executive Committee, the Treasurer of the National Electric Light Association shall pay over to the proper officers of the said Section an amount not to exceed 50 per cent of the fixed yearly dues received from all the Class A and Class D members of the Section and an amount not to exceed 50 per cent of the yearly dues received from the Class B and Class E members of the Section up to a membership of 500, and an amount not to exceed 25 per cent of the yearly dues of the Class B and Class E members for the membership from 500 to 1000. The Executive Committee shall, however, limit these appropriations to the necessary and reasonable expenses of the Section. The Section officers shall file a budget during January of the estimated expenses for the ensuing year for the approval of the Executive Committee, and shall also file a detailed statement of the actual expenses at the close of each year.

This amendment is proposed to encourage as large a Class A and Class D membership as possible in any geographic section and to enable the Section to receive a percentage of the dues paid in by the first 1000 Class B and Class E members. In line with the recommendations of the special finance committee's report it is planned that the National Association's treasury shall retain a larger amount of the dues from the individual members when the Section's Class B and Class E membership exceeds 500 and up to 1000 members and all the amount paid in by a membership in excess of 1000.

ARTICLE XVI.

SECTION 2. Upon certification to the Treasurer of the National Electric Light Association by the executive officers of any National Special Section stating the paid-up membership of said Section, and upon approval of the Executive Committee, the Treasurer of the National Electric Light Association shall pay over to the proper officers of said Section an amount not to exceed $2.50 per year per member of said Section. The Executive Committee shall, however, limit these appropriations to the necessary and reasonable expenses of the Section. The Section officers shall file during January a budget of the estimated expenses for the ensuing year for the approval of the Executive Committee, shall file a detailed statement of the actual expenses at the close of each year, and shall report in writing at least every 60 days stating the work being carried on by the Section.

Respectfully submitted,

Committee
FRANK W. FRUEAUFF, *Chairman*
W. C. L. EGLIN
W. W. FREEMAN
R. S. ORR
H. T. SANDS
H. H. SCOTT

It was regularly moved, seconded and voted that the amendments to the Constitution as read, be adopted.

MR. W. C. L. EGLIN, Philadelphia: Mr. President, I would like to suggest that this Convention extend its thanks, by telegraph, to our very efficient friend, the Assistant Secretary, Miss Harriet Billings. I will put this in the form of a resolution as follows, and Mr. Doherty, who is presiding in another part of this room, has asked me to say that he will be glad to second such a resolution:

RESOLVED: That the Thirty-fifth Convention extends its most hearty greeting and appreciation to Miss Billings for her very efficient and loyal work of the past.

The resolution was adopted.

THE CHAIRMAN: We will now have the report of the committee appointed on the President's address.

MR. EGLIN: Your Committee to which was referred the President's address commends its careful reading to the members, as it presents in a most clear, concise manner the work of the Association during the past year and states forcibly many features of especial interest to the entire membership. We heartily endorse the recommendations of the President regarding the growth of membership and think that each member company should consider it a duty to obtain membership in the Association for any company in its vicinity, not yet affiliated; and we recommend to the incoming administration that the suggestion of the President as to a traveling representative for increasing its class membership be adopted.

We endorse the recommendation of the President that the *Question Box* be issued by a permanent editor located at the executive headquarters.

Your Committee believes with the President, that considering the large increase in membership and the consequent increase in the amount of work placed upon the officers, the time has come when the number of vice-presidents should be increased, and recommends to the incoming administration that provision be made for this increase.

The Committee agrees with the President's recommendation that the dues of the member companies should be increased, and recommends to the incoming officers and the Executive Committee that provision be made for this during the coming year, and, further, that they take up with the member companies the question of providing means for establishing the reserve fund recommended by the President.

The suggestion by President Gilchrist that the Association have its own headquarters is one which should be kept before the members, so that when the opportunity presents itself for getting such a building or site, advantage can be taken of it.

We strongly endorse the administration and the good feeling which has been maintained with institutions of learning and the Public Service Commissions during the past year.

We endorse the recommendations of the President regarding electrical securities and believe that the Association through its officers and Executive Committee should continue to do all that is possible to interest the public further in electrical securities.

Committee {
WM. C. L. EGLIN, *Chairman*
R. H. BALLARD
J. E. DAVIDSON

I would like to say further that the Committee considers of great importance the question of publishing the President's address in some form, either in the *Bulletin* or in paper form, as the Executive Committee may see fit. We believe there are many of our members who would like to have that address at the earliest possible date.

It was regularly moved, seconded and voted that the report of the Committee and also the suggestions made by the Chairman be adopted.

MR. FARLEY OSGOOD, Newark, N. J.: At the Technical Session the Overhead-Line Construction Committee report for the year was considered and there were one or two minor changes made in the 1911 report. They relate to the use of strain insulators in guys and the changes were made in order that the report as it has been standing for the year may exactly coincide with our report as adopted by the steam railroad interests at their convention in March, 1912, by the association which is known as the American Railway Engineering Association.

At our last convention there was some controversy concerning the retroactive effect of the report on companies, and those difficulties have all been worked out during the year, and the Pennsylvania people who were most interested in that phase of the situation, through their representative, Mr. E. H. Davis, of Williamsport, came to the conclusion that the committee could cover their requirements in offering a statement for record which gave an interpretation of the section No. 1 headed, "Scope" in the crossing report. That statement was given at the Technical Session, and was approved and is in the minutes of that session. Under the circumstances it seems well that this General Session accept the report with the changes as they were adopted at the Technical Session to-day. The Technical Session agreed unanimously to this resolution which we now offer. RESOLVED: That the Technical Session recommend that the General Session approve the overhead line construction specifications, including the changes adopted to-day.

RESOLUTION CHANGING SECTION 18 OF THE OVERHEAD LINE CONSTRUCTION COMMITTEE'S REPORT

Strain insulators shall be used in guys from wooden poles carrying any power wire of less than 6600 volts, provided the guys are not through grounded to permanently damp earth. Strain insulators shall not be used in guying steel structures nor required on wooden poles carrying wires all of which are 6600 volts or more, provided the guys are through grounded to permanently damp earth.

STATEMENT FOR RECORD ONLY.

The interpretation of the National Electric Light Association of Paragraph 1 of Section 4, of the Report of the Overhead Line Construction Committee, as presented at the 1911 convention, is that the ordinary tie form of construction is proper for all 2400-volt railroad crossings,

> provided the construction conforms to the requirements of Section 1 of the Report, and applies only to voltages and conditions as covered therein, and where the crossing span does not exceed 125 feet.

MR. ARTHUR WILLIAMS: May I ask if the statement "for record only" takes care of Mr. Davis' objections to the report and is finally cleared of all his objections?

MR. OSGOOD: Absolutely, and I have a letter to that effect with me.

It was regularly moved, seconded and voted that the resolution be adopted.

MR. W. H. BLOOD, JR., Boston: At the Technical Session Tuesday, the report of the Committee on Grounding Secondaries, was read, and the following vote was passed unanimously:

VOTED: That the Report of the Committee on Grounding Secondaries be referred to the Executive Session for action, with the recommendation that this Session advocates and asks for the adoption of the Report.

In accordance with this vote I now bring the matter up for action at the Executive Session and make the following motion:

I move that the Executive Session approve and adopt the Report of the Committee on Grounding Secondaries and that said Report be referred to the Executive Committee of the Association for approval before it becomes binding upon the Association.

The passage of this motion will mean simply that this Association advocates the mandatory grounding of secondary alternating currents up to one hundred and fifty volts and the permissive grounding above that voltage.

This Report has already been adopted by Committees of the Association of Edison Illuminating Companies, by the American Institute of Electrical Engineers and by the National Inspectors Association.

It is probable that the electrical convention of the National Fire Protective Association will in March, 1913, pass the rule and make it part of the National Electric Code. The reason this matter is now referred to the Executive Committee is that to comply with the rule will require the expenditure of considerable sums for new construction by some of the companies. Many of our companies have already adopted the practise of grounding their secondaries but others have not. The cost of grounding individual secondary installations ranges from three dollars in some cases to nearly ten in others. The practise generally adopted is for the lighting company to ground all old installations at its own expense and on all new work to require it as a part of the customers' wiring installation.

The report of the committee is in accord with the best engineering practise, and, as I said at the start, I hope that the motion offered will prevail.

It was regularly moved, seconded and voted that the motion be adopted.

THE CHAIRMAN: We will now have the report of the Committee on Memorials, Mr. T. C. Martin, Chairman.

COMMITTEE ON MEMORIALS

The Committee submits herewith brief biographical notices of men who have died during the year and who have been either actively connected with the work of the Association or active in the central station industry. The names included are those of Mr. William Richard Brixey, Prof. Henry Taylor Bovey, Mr. C. C. Cokefair, Mr. Thomas Jefferson Coolidge, Jr., Mr. Daniel D. Dickey, Mr. Samuel Morris Dodd, Mr. Jacob H. Evans, Mr. Lee D. Fisher, Mr. William Penn Hazeltine, Mr. N. Wetmore Halsey, Mr. Edwin Hawley, Mr. Caryl Davis Haskins, Mr. George W. Hebard, Mr. Daniel C. Hemingray, Mr. James McCormack, Mr. George B. Moffatt, Mr. B. G. McNabb, Mr. John F. McGlensey, Mr. Robert Mather, Mr. Edgar Wood Mix, Mr. Otis E. Putnam, Mr. Hinsdill Parsons, Mr. Frank Ridlon, Mr. Alden M. Young and Mr. Charles I. Young.

It will be seen that the list is unusually large and that the Association and the industry have alike sustained a severe loss in being deprived of such valuable services. This report is an inadequate tribute to their memory.

T. C. MARTIN, *Chairman.*

MR. WILLIAM RICHARD BRIXEY died on June 9, 1911, at Seymour, Conn. He was one of the leading manufacturers of insulated wire and cables. He was born at Southampton, England, May 11, 1851, educated at a well-known grammer school there, and then entered the British Mercantile Marine service, commanding his own ship and visiting all the leading ports of the world. He came to this country in 1878, became an American citizen, and went into business with his brother-in-law, Mr. A. G. Day, a pioneer in the American rubber industry and the inventor of "kerite." In 1879 he married Miss Frances N. DeWolf, daughter of Alva G. DeWolf, a co-worker of Mr. Day's and also an inventor of some note. The Day plant was at Seymour, Conn., and there Mr. Brixey developed the business with remarkable energy and intelligence, mastering it in every detail and becoming general manager on the death of Mr. Day, and sole proprietor upon the death of his sister, Mrs. Day. Mr.

Brixey was not satisfied with the use of his cables in the telegraph and telephone field or with the early indorsement of such men as Morse, but pushed out into larger developments in other fields. Noteworthy among these developments were the supplying and laying of the Alaskan cable, the furnishing of the Panama Zone cable, and the making of the wires and cables for the Pennsylvania Railroad tunnel and terminal connecting the two shores of the Hudson and East Rivers. In 1908 Mr. Brixey incorporated the business as a company and soon after retired, leaving it to the management of his eldest son, Mr. Richard D. Brixey, president of the Kerite Insulated Wire and Cable Co. Mr. Brixey was quite active in public life, and was a member for many years of the Old Guard of New York City with the rank of captain. He was a member of the American Institute of Electrical Engineers and of the Brooklyn Club and a high degree Mason, and the firm was one of the oldest in the membership of this Association, with which it had an unusually close connection from the fact that Mr. George F. Porter, one-time Secretary and Master of Transportation, was prominently identified with the Brixey interests. At the time of the terrible subway explosion at Murray Hill, N. Y., in 1902, he was injured by glass blown into his room at the adjacent hotel.

PROF. HENRY TAYLOR BOVEY, well known in this country for his educational work while dean of the Department of Applied Science at McGill University, Montreal, Canada, died at Eastbourne, England, on February 2, 1912. He was born in Devonshire, England, on March 7, 1852, and hence was in his sixtieth year at the time of his death. He was graduated from Cambridge University with high honors in mathematics and was made a fellow in Queen's College. He was for a time assistant engineer of the Mersey Docks and Harbor Works, and was appointed Professor of Civil Engineering and Applied Mechanics at McGill University in 1877. From 1878 to 1908 he was dean of the newly constituted Department of Applied Science, which developed with rapidity under his leadership. In 1908 Professor Bovey was appointed rector of the Imperial College of Science and Technology in London. Professor Bovey was an honorary LL.D. of McGill University and Queen's College and D.C.L. of Bishop's College. He was elected Fellow of the Royal Society of London in 1902 and honorary Fellow of Queen's College in 1906. He is survived by a wife, two sons and three daughters. Professor Bovey was a generous host when the Association visited Montreal in 1891 and gave there the first electrical exhibition on Canadian soil. At the banquet closing the convention he was presented by the Association with an elaborately mounted Edison phonograph, in recognition of his services. He always took a deep interest in electrical development and to the end kept up his close intimacy and friendship with many members of the Association.

MR. C. C. COKEFAIR, president and general manager of the Great Northern Development Co., died at Duluth, Minn., on December 13, 1911, after an illness of about two weeks, of pneumonia. Mr. Cokefair was born in Bloomfield, N. J., sixty-three years ago, and went to Duluth, Minn., in 1899. He was the originator and promotor of the Great Northern Power Co., of Duluth, and after the completion of that enterprise became interested in other water-power projects in the Northwest, principally on the Mississippi River.

MR. THOMAS JEFFERSON COOLIDGE, JR., who was largely interested in electric service properties, died at his home in Boston on April 14, 1912. Mr. Coolidge was a graduate of Harvard College, Harvard Graduate School and Harvard Law School. In 1890, when only twenty-seven years old, he organized the Old Colony Trust Co. Although banking was the chief business of Mr. Coolidge, he had many other financial interests, especially of late in the field of electric public-service Companies. During the past year his increasing illness led him to resign from many directorships, but up to a short time before his death he was director of the American Bell Telephone Co., American Telegraph and Telephone Co., Western Telephone and Telegraph Co., Edison Electric Illuminating Co. of Boston, General Electric Co., Georgia Railway and Electric Co., Boston Elevated Railway Co., Underground Electric Railways Co., Ltd., of London; Seaboard Air Line Railway, Amoskeag Manufacturing Co., Lawrence Manufacturing Co. and American Trust Co.

MR. DANIEL D. DICKEY, general manager of the National Carbon Co., died at Cleveland, March 8, 1912, as the result of an operation for internal trouble. He was born at Pittsburgh, Pa., October 9, 1853, attended the public schools of that city and later the Western University of Pennsylvania, now the University of Pittsburgh. As a pioneer in the carbon manufacturing business of the United States in 1883 he acquired an interest in the Pittsburgh Carbon Co. A few years later the plant was removed to Jeannette, Pa., and the name changed to Faraday Carbon Co. Mr. Dickey had a controlling interest in this company until the consolidation of several companies into the National Carbon Co. of New Jersey in 1899, when he became a director and general manager of the consolidated companies, and moved from Pittsburgh to Cleveland. In his quiet, strong way he assisted in many ways in advancing the interests of his adopted city. He was a member of the Union, Country, Roadside and Rowfant Clubs and of the Cleveland Chamber of Commerce and the Chamber of Industry. By the employees of the National Carbon Co. he was held in the greatest respect, not only as an officer but as a friend and helper. As a manager he never gave decisions hastily, but only after carefully considering all the facts and the wishes of everyone interested. The great enterprise he helped to create and build up is testimony to his energy and ability.

MR. SAMUEL MORRIS DODD, the first president of the Wagner Electric Manufacturing Co., which position he held continuously until the present year, died on February 12, 1912, at the age of seventy-nine years. Mr. Dodd was identified for more than fifty years with St. Louis corporations, including in recent years the National Bank of Commerce, the American Central Insurance Co., the Commonwealth Trust Co. and the Title Guarantee and Trust Co. He organized and for many years headed the Missouri Edison Electric Co., retiring from the management when that company was sold to the North American Co., and the present Union Electric Light and Power Co. was formed. It was the urgent need of the Missouri company for better distributing transformers that in 1891 led Mr. Dodd and some other officers and stockholders of that corporation to lend their support to Mr. Herbert A. Wagner, which resulted in the formation of the Wagner Electric Manufacturing Co. with an initial capital of $25,000. Mr. Dodd became its first president and guided the new company through the vicissitudes to which it was exposed until it became one of the leading electrical industries of the West. He was a member of the St. Louis, Noonday, Country, Cuivre and Adirondack Clubs and honorary vice-president of the Missouri Society of the Sons of the American Revolution. He had a fine country place in the Adirondacks, and took great pleasure in spending his summer holidays there. He was fond of outdoor life and insisted upon having a houseful of young people around him. Mr. Dodd was one of the organizers and supporters of the Young Women's Christian Association in St. Louis; and in addition to other donations he gave it the use of his former residence on Garrison and Lucas Avenues rent free. Mr. Dodd was also one of the leading art collectors of the Middle West. The St. Louis League of Electrical Interests and a large number of other organizations adopted appropriate resolutions on the death of Mr. Dodd.

MR. JACOB H. EVANS, secretary of the Edison Electric Illuminating Co. of Brooklyn, N. Y., died suddenly at his Brooklyn home on September 2, 1911. He was in the service of the Brooklyn Company for thirteen years, first as an auditor and later as secretary. The loss of his wife, two years ago—a cousin of Mr. A. N. Brady—was a severe blow to Mr. Evans from which he never recovered. Mr. Evans at the time of his death was also secretary of the Kings County Electric Light and Power Co. and secretary and director of the Amsterdam Electric Light, Heat and Power Co.

MR. LEE D. FISHER, right-of-way agent for the Public Service Company of Northern Illinois, died at his home in Joliet, Ill., on February 8, 1912. He was an engineer of unusual ability. He was born in Elyria, Ohio, in 1875, but spent his boyhood and youth in St. Louis, where he was graduated from the electrical and mechanical engineering courses of Washington University in 1897. He was in the Spanish-American War and was chief engineer of the transport "Buffalo" during the war and subsequent operations in the Philippines. In 1900 Mr. Fisher engaged in electric-railway construction, and was the engineer in charge of the building of three lines radiating from Columbus, Ohio. In 1903 he aided in building the Joliet, Plainfield and

Aurora Interurban railway and also the Joliet and Southern Traction Company's line. He became treasurer and chief engineer of the company last mentioned, of which his father, Mr. H. A. Fisher, is president. He had made his home in Joliet for several years, and then accepted the position of right-of-way agent with the new Public Service Co. of Northern Illinois. He died after an illness of only a few weeks, heart disease being given as the cause.

MR. WILLIAM PENN HAZELTINE, for many years electrical superintendent of the Lynn Gas and Electric Co., died July 18, 1911, in Lynn, Mass., after a protracted illness. He was a native of New Hampshire and for a time was principal of the evening drawing school of Lynn. He was one of the first constructing engineers of the Thomson-Houston Electric Company and in 1890 became connected with the Lynn Gas and Electric Co. He was a graduate of the Lynn High School and of the Friends School in Providence. A widow and four children survive him.

MR. N. WETMORE HALSEY, of the financial house of N. W. Halsey and Company, of New York, Chicago and other cities, died in New London, Conn., on July 1, 1911. Mr. Halsey organized the banking firm which bears his name, and, as it was a prominent dealer in the bonds of public utility corporations, he enjoyed a considerable acquaintance among electrical men. Mr. Halsey was a director of the Electrical Utilities Co., the Netherlands Tramway Corporation and the Pacific Gas and Electric Company. Before organizing his own business he was for many years the resident partner in New York City for N. W. Harris and Company.

MR. EDWIN HAWLEY, well known in financial and railroad circles, died at his home in New York City on February 1, 1912, from heart disease. He was born in Chatham, N. Y., in 1850, and since the death of Edward H. Harriman was looked upon as the foremost railroad reconstructor of the country. His activities were not devoted entirely to railroads, however. Until very recently he was president of the Great Western Power Company, the California Electric Generating Company, and also the

Western Power Company, as well as vice-president of the United States Lighting and Heating Co. In addition to these lighting properties Mr. Hawley was interested in electric railways, notably the Interborough Rapid Transit Company and the Interborough Metropolitan Company. He was a member of the firm of Hawley and Davis, New York.

MR. CARYL DAVIS HASKINS, manager of the lighting department of the General Electric Co., died in Salt Lake City on November 18, 1911, after an attack of pneumonia lasting only two days. Mr. Haskins was born in Waltham, Mass., in 1867 and obtained his early education in the public schools of Philadelphia and Dedham. In 1879 he went to England and attended schools devoted to preparation for military and engineering work. Later he studied under the London University tuition system for about a year and in 1887 entered the employ of Haskins, Davis and Co., of London and Boston, Mass., from which the commencement of his technical work dates. After about six months, during which time he specialized on gas-engine work, Mr. Haskins entered the shops of S. Z. de Ferranti, and there he was advanced to the meter department, of which he became foreman. During this period he was also connected with some of the early work of the famous old Grosvenor and Deptford central stations. Returning to the United States, in 1889 Mr. Haskins entered the employ of the Thomson Electric Welding Company, at Lynn, Mass., in the capacity of designing draftsman, but was almost immediately transferred to the Thomson-Houston Electric Co. as assistant foreman of the meter department at Lynn. Shortly afterwards he was given charge of the company's outside meter interests. The consolidation resulting in the formation of the General Electric Co. gave Mr. Haskins another promotion and placed him at the head of the meter interests of the consolidated company. In 1893 he was given, in addition, charge of the company's instrument department, and so on until he became the head of the lighting department and came into close relationship with this Association and its members, among whom he had any number of friends, who will long cherish the memory of his versatility and brilliancy, as well as of the hospitality extended at his home, long one of the social centers of Schenectady. It may be added that as an author and speaker Mr. Haskins enjoyed an enviable reputation, and that almost at the moment of his death he was scheduled for an address before the Eastern New York Section of the Association on the electric lighting industry.

MR. GEORGE W. HEBARD, acting vice-president of the Westinghouse Electric and Manufacturing Co., died at his home in New York City, November 17, 1911. He was born in Barre Center, N. Y., in 1845 and was therefore sixty-six years of age. He had been in poor health for some time before his death. Mr. Hebard was identified with the early manufacture of Weston central station apparatus, becoming president of the United States Electric Lighting Co. of Newark, in 1882, and was connected with the early history of the generation and distribution of electricity for lighting in New York City as a director and stockholder of the United States Illuminating Co. In this relation he had to do with the equipment of the Weston arc lighting system of the Brooklyn Bridge, parts of which are still in service. Later, as president of the United Electric Light and Power Co., he was closely associated with the introduction of the Westinghouse alternating-current system in New York City. He was active later in the change of the distribution system from overhead to underground. At the time the United States Co. was taken over by the Westinghouse Co., Mr. Hebard was president of the former, and in the re-organization he was made vice-president of the Westinghouse Co., and, in 1888, when his company took over the Sawyer-Man Co., Mr. Hebard received charge of the newly acquired organization. Besides his participation in his chosen profession, Mr. Hebard was also very active in social, religious and philanthropic work in New York. He was of genial disposition and keen judgment, and a business man with a wonderful grasp of affairs. He was a member of the Union League, the Lawyers, the Engineers', and several other clubs. Mr. Hebard leaves a widow and two sons.

MR. DANIEL C. HEMINGRAY, secretary and treasurer of the Hemingray Glass Co., of Covington, Ky., and Muncie, Ind., died at the Queen City Club, Cincinnati, Ohio, on December 14, 1911, from apoplexy. He was fifty-four years old and was born in Covington, Ky. He attended the Woodward High

School in Cincinnati, where he was a classmate of President Taft, and later entered the Massachusetts Institute of Technology. Before graduation he returned to Covington and engaged in business with his father and brother, Mr. Ralph Hemingray, now president of the Hemingray Glass Co., one of the first concerns to take up the production of glassware for the electrical industries. Mr. Hemingray was a member of the principal Cincinnati clubs and a non-resident member of many clubs throughout the country, much of his time being passed in traveling in connection with his business. He was a director of the Cincinnati Trust Co. and of the Suspension Bridge Co. and one of the first stockholders of the Latonia Racing Association. At one time he was a member of the Covington Water Works Department. Mr. Hemingray was extremely popular in Cincinnati and had large circles of friends in different sections of the United States. His jovial disposition and his good-fellowship were particularly appreciated in his club life. As remarked by a friend in the central station field where he was widely known and most popular, "There were no dull moments in his company, and many are the Queen City Club members who, oppressed by the cares of business, found momentary rest from their worries in the optimistic, jovial and happy temperament of 'Dan' Hemingray."

Mr. James McCormack, chief clerk of the Edison Electric Illuminating Co. of Brooklyn, died January 19, 1912, in the Prospect Heights Hospital. Mr. McCormack was born in Brooklyn in 1882 and was connected with the Edison Company for six years. He was vice-president of the Brooklyn Company Section of the National Electric Light Association during 1911 and also served on some of the important committees. He took an active interest in this Association work.

Mr. George B. Moffatt, a director of the Electric Bond and Share Co., New York City, and formerly president of the Oregon Electric Railway, which he was largely instrumental in organizing in 1906, died in Portland, Ore., on December 4, 1911, at the age of fifty-seven years.

Mr. B. G. McNabb, contract agent of the Montreal Light, Heat and Power Company, was accidentally killed by his own gun while duck hunting on October 21, 1911. In attempting to draw his gun toward him in order to shoot a gull overhead the charges in both barrels were exploded with the fatal result noted. The deceased was born in St. Thomas, Ontario, on November 19, 1892. He is survived by a widow and a young son. He was well known amongst members of the Association and highly esteemed by his colleagues in the Montreal Company.

Mr. John F. McGlensey, illuminating engineer for the Union Electric Light and Power Co., of St. Louis, died on November 11, 1911. Several years ago Mr. McGlensey was one of the estimating engineers in the contract department of the Commonwealth Edison Company of Chicago. He left that company to become a manager for Henry Newgard and Company, electrical contractors in Chicago, and afterwards joined forces with Kohler Brothers of the same city. About a year ago he accepted the position in St. Louis which he held at the time of his death. Mr. McGlensey was a man of high character, and his death is greatly regretted by many friends.

Mr. Robert Mather, chairman of the board of directors of the Westinghouse Electric and Manufacturing Co., died at his home in New York on Tuesday, October 24, 1911, from acute peritonitis. He was born July 1, 1859, at Salt Lake City, and received his early education in the public schools of Galesburg, Ill. Owing to the necessity of making his own living, he left high school at the age of thirteen and for three years was in a factory engaged in the manufacture of telephone instruments, subsequently obtaining employment in the office at Galesburg of the master mechanic of the Chicago, Burlington and Quincy R.R. While working there he prepared for college by studying at night. In 1882 he was graduated from Knox College, and by continuing his night studies, working by day at railroading, he obtained three years later the degree of A.M. from that college. Recently the degree of LL.D. was conferred on him by Knox College, of which he was one of the trustees at the time of his death. From 1882 to 1885, Mr. Mather worked in the treasurer's office of the Chicago, Burlington and Quincy Railroad, devoting his spare time to the study of law, and in 1886 he was admitted to the Illinois bar. In 1889 he became attorney at Chicago for the Chicago, Rock Island and Pacific R.R., and in 1902 was elected general counsel for the road. In the meantime he had occupied various offices of the road, including that of second vice-president. In 1889 he became chairman of the executive committee and in 1904 president of the Rock Island Co. of New Jersey. In 1903 he was elected third vice-president of the St. Louis and San Francisco R.R., the following year becoming first vice-president. He was also first vice-president of the Chicago and Eastern Illinois R.R., and of the Evansville and Terre Haute R.R., and chairman of the board of directors of the St. Louis, Kansas City and Colorado R.R. Mr. Mather was a director in a large number of important corporations, including the National Bank of the Republic, of Chicago, and the Mercantile Trust Company, American Realty Company, and Equitable Life Insurance Company of New York. He was also interested in the development of the traction system of Havana, being a director of the Havana Electric Railway Co. In January, 1909, Mr. Mather was made chairman of the board of directors of the Westinghouse Electric and Manufacturing Co., and thereupon severed his railroad connections and concentrated his work on the Westinghouse interests. Mr. Mather was a man of forcible character and positive methods, which gave him a dominating influence in any interest with which he was closely associated. He took deep interest in electrical matters, and one of the latest public functions he attended was the luncheon at the opening of the 1911 New York Electrical Show, a few days before his death. He was also active in promoting and maintaining friendly relations between his company and the Association.

MR. EDGAR WOOD MIX, well known in electrical circles from his connection with the early Thomson-Houston Electric Co., was drowned in the English Channel on the night of November 12, 1911. The conditions surrounding his death are unknown, as he was alone when he disappeared from the Channel steamer. Mr. Mix was born near Columbus, Ohio, February 4, 1867. He was graduated from the Ohio State University with the degree of B.S., in 1888. In August of that year he entered the employ of the Thomson-Houston Electric Co. in the department devoted to the manufacture of watt-hour meters. He was in close touch with all the early electric lighting work of the Company. In 1890 he went to Paris and established there a factory for building meters for the Thomson-Houston International Electric Co. He occupied the position of chief engineer of this firm until shortly before his death, when he resigned to become manager of the European division of the General Motors and Export Co., of Detroit. In recent years he had been much interested in aeronautics, and was a member of the Aero Clubs of both France and America. On October 5, 1909, he won for America the international balloon race at Zurich, Switzerland, and he had been chosen the delegate to the international aviation conference in Rome in November, 1911.

MR. OTIS E. PUTNAM, for many years a prominent merchant, and director of the Worcester (Mass.) Electric Light Co. from 1904 to 1910, died at his home on June 9, 1911. At the time he was a leading director of the Worcester and Holden Street Railway Co.

MR. HINSDILL PARSONS, vice-president and general counsel of the General Electric Co., Schenectady, N. Y., died on April 28, 1912, from injuries which he sustained earlier in the day in an automobile accident near Albany, N. Y. He was born in Hoosick Falls, N. Y., on February 10, 1864. He was educated at Trinity College and at the Albany Law School. In 1889 he was appointed patent attorney for the Walter S. Wood Harvester Co., at Hoosick Falls. He became associated with the General Electric Co. in 1894 as counsel, and in May, 1901, was elected vice-president of the company. Mr. Parsons was formerly president and director of the Schenectady (N. Y.) Railway, and at the time of his death was president of the Schenectady Illuminating Co. and the Mohawk Gas Co., and a director of the Electric Bond and Share Co. (N. Y.), the Washington Water Power Co., Spokane, Wash., and the Schenectady Power Co. He is survived by his wife, who is a sister of Mr. Anson W. Burchard, assistant to Mr. Charles A. Coffin, president of the General Electric Co. Mr. Parsons was widely known in the central-station field and took an active interest in the work of the Eastern New York Section of this Association.

Mr. Frank Ridlon, one of the foremost supply dealers in the New England electrical field and a pioneer in the manufacturing branches of dynamo and motor work, died in his home in Brookline, Mass., on December 1, 1911, after three years of illness following a paralytic stroke. He was born in Boston in 1838, and at an early age became interested in the study of electricity. For many years he was president of the Frank Ridlon Company, Boston, dealer in electrical supplies, and a specialist in the maintenance of central-station and railway equipment, holding this office at the time of his death, as well as the presidency of the Berlin (N. H.) Street Railway, which he built, and the Boothbay Harbor Electric Light and Power Co. of Boothbay, Maine. In his earlier days he was the Boston representative of Brush Electric Co., of Cleveland, Ohio, later becoming connected with the Sun Electric Co., lamp manufacturers, of Woburn, Mass. Twenty-one years ago Mr. Ridlon founded the Boston Electric Light Club, being its president for eight years. At one time he was also vice-president of the National Electric Light Association, in whose early development he took an active share and the keenest interest. In face and figure Mr. Ridlon greatly resembled the late Denman Thompson, the actor, who was his close personal friend. He was for many years a member of the Ancient and Honorable Artillery Company of Boston and was an honorary member of the Hooker Association and Abington Post, G. A. R. He was regarded as the dean of the members of the New England Street Railway Club. A widow and one daughter survive him.

Mr. Alden M. Young died in New York on December 3, 1911. He was born at Hadley, N. Y., September 6, 1853, and after leaving school learned the telegraph business, filling positions successively at Saratoga, Albany, Syracuse, Buffalo and New York. In 1878 he organized the telephone exchange at Waterbury, Conn., and in 1890 he built Waterbury's first electric light station, being thus a pioneer in both industries. He then organized the Waterbury Traction Co. and later merged it with the lighting company. About the same time he also founded the New England Engineering Co., and contributed largely to the successful introduction of lighting and railway plants in several New England cities. His work as an organizer in Waterbury and in connection with the various other enterprises in which he was the guiding spirit attracted much attention in financial and electrical circles. He later came to New York and helped to organize the Kings County Electric Light and Power Co., of Brooklyn. At the 1898 Chicago convention of the National Electric Light Association, Mr. Young was elected President, succeeding Mr. Samuel Insull, and he enjoyed a highly successful administration, giving much time and thought to the work. Early in life Mr. Young became associated with Mr. A. N. Brady and other financiers in many enterprises and at the time of his death he was associated with the following public service corporations either as an executive officer or as a director: Albany and Hudson R.R. Co., American Gas and Electric Co., Connecticut Power Co., Connecticut Railway and Lighting Co., Corning Gas and Electric Co., Dayton Lighting Co., Edison Electric Illuminating Co. of Brooklyn, Electric Bond and Share Co., Fairmont and Clarksburg Traction Co., Kings County Electric Light and Power Co., New London Gas and Electric Light Co., Northern Westchester Lighting Co., Norwich Gas and Electric Co., Rockville Gas and Electric Co. and the Stamford Gas and Electric Co. He was also director of the National Carbon Co. and the Consolidated Engine Stop Co., and president of the New England Engineering Co. and other industrial enterprises. Mr. Young was in business with his son-in-law, Mr. W. J. Warner, manufacturers of railroad supplies, in New York City. He is survived by a widow and four married daughters. The Executive Committee of the Association adopted resolutions of profound regret at his death, and of sympathy with the family, to which they were forwarded, while his funeral was attended by several officers of the Association.

Mr. Charles I. Young, of the Westinghouse Electric and Manufacturing Co., died January 6, 1912. Mr. Young was graduated from Princeton in the class of 1883, following which he was employed by the Edison Machine Works at New York testing generators during 1884 and 1885; later he was superintendent of the Edison Illuminating Co., following which he became attached to the Westinghouse interests in the fall of 1888. Owing to an electric shock of 2500 volts received in 1888 he was for the three years following that accident incapacitated for work. In 1891 he returned to Pittsburgh to continue his services with the company, and, while physically weak and partially dependent upon the help of another, his keen insight into human nature and his knowledge of the electrical business fitted him exceptionally for work in the sales department as an advisory engineer, first in the Philadelphia office, later in the expert department, and finally at East Pittsburgh. On the inauguration of a commercial training department in the sales organization of the electric company a few years ago he was made instructor, doing educational work for which his ability and charming personality fitted him perfectly.

It was regularly moved, seconded and voted that the Report be received.

SECRETARY MARTIN: I have with me the minutes of the meetings of the Executive Committee of this Association and I am instructed to read the following paragraph:

"The members of the Executive Committee have voted unanimously that Mr. A. C. Dunham, of Hartford, Conn., should be made an honorary member of the Association. The committee voted in accordance with the requirements of the Constitution that this action be recommended to the Convention at Seattle for endorsement by the Association at large."

It was regularly moved, seconded and voted that the action of the Executive Committee be approved.

THE CHAIRMAN: We will now have the report of the Committee on Resolutions.

MR. ARTHUR WILLIAMS, New York City, then presented the following report:

RESOLUTIONS

WHEREAS, The Exhibition Committee this year, in spite of many difficulties connected with transportation, etc., has placed before the delegates in the Seattle Armory a remarkably select, comprehensive and complete display of modern apparatus and supplies, produced by the Class D manufacturing companies; has given them a setting of unsurpassed beauty and richness and has also achieved illuminating effects hitherto unobtained in interior lighting,

RESOLVED, That the thanks of the Association be tendered to Mr. J. C. McQuiston, Chairman of the Committee; to its Secretary, Mr. Walter Neumuller; to his assistant, Mr. Joseph B. Murray; to the individual members of the Committee, and to Mr. M. A. Singer, Managing Decorator, for this and many other services contributing to the success of the meeting.

WHEREAS, The Transportation problems in connection with the annual convention have been more difficult and complex by far than those of any other convention, and

WHEREAS, The arrangement and operation of special trains have been carried through with brilliant executive ability and immense success, enhancing the pleasure and comfort of every delegate, it is hereby

RESOLVED, That the cordial thanks of the Association be tendered to Mr. Charles H. Hodskinson, Master of Transportation; Mr. G. W. Elliott, Mr. H. Spoehrer, Mr. C. B. Burleigh, Mr. G. A. Freeman, Mr. J. C. McQuiston, Mr. R. H. Ballard and Mr. W. J. Grambs for handling the special trains, as well as to all other assistant masters of transportation for this invaluable service.

RESOLVED, Also, that we tender our cordial thanks to the various railroad associations and railroads and to their representatives, co-operating with the members of the Transportation Committee and taking such steps as were necessary to make the journey of our membership comfortable and enjoyable and in carefully fulfilling the time schedules between various points. It was noted that in spite of immense distances and the various stops that were made for the entertainment of our members, practically all the trains arrived on time or ahead of time.

In passing through various cities our delegates were received most cordially. At several points special entertainment was provided by member companies and their local committees, therefore be it

Resolved, That the special thanks of this Association be tendered to all of the companies providing or taking part in entertainments of this character, and especially to the

At Chicago—Commonwealth Edison Company for providing automobiles for the members during the short stay in Chicago;

At Riverside, Cal.—Where our local membership provided automobiles for visiting the various points of interest;

At Ontario, Cal.—Where the delegates were entertained by the Pacific Electric Heating Company and the Chamber of Commerce, which presented the delegates with baskets of flowers and oranges;

At Los Angeles and Pasadena—Especially to our local membership, the Citizens' Committee, and the Chamber of Commerce, which tendered a reception;

At San Francisco—Where the united electrical interests as represented through our membership, provided the delegates with unlimited automobiles, tendered a luncheon at the Cliff House and a banquet on the last evening of their stay at the St. Francis Hotel.

Further evidence of the unsurpassed hospitality of this city was shown by large bouquets of flowers, baskets of fruit and electric irons for the ladies, awaiting the guests in their rooms; our thanks are also tendered to the management of the St. Francis Hotel, where every facility was provided for the convenience and comfort of the delegates.

At Vancouver and Victoria, B. C.—Where the British Columbia Electric Railway and Light Company extended generous hospitality of the most agreeable character; and

At Westminster, B. C.—Where Mayor Lee entertained the delegates at a La Crosse match.

Whereas, The electrical interests of the city of Portland have provided large quantities of flowers to our delegates passing through, and daily to our members while in session, and have invited the delegates to return to the city at the conclusion of the convention for the Rose Festival, therefore be it

RESOLVED, That the cordial thanks of the Association be tendered to the electrical interests of the city of Portland.

WHEREAS, The Puget Sound Traction, Light and Power Company, assisted by many other representatives of Messrs. Stone and Webster have done everything humanly possible to make our stay in the City of Seattle enjoyable, therefore be it

RESOLVED, That our hearty thanks be tendered to this Company and to Messrs. Stone and Webster for the many courtesies and hospitalities that have been extended to this Association and particularly for the excursion to Snoqualmie Falls and the White River Development.

We do further RESOLVE, That our warmest thanks be tendered to the Entertainment Committee, Mr. H. T. Edgar, Chairman; the Ladies Entertainment Committee, Mr. G. B. Harrington, Chairman; the Golf Committee, Mr. Frank Dabney, Chairman; the Excursion Committee, Mr. Morton Ramsdell, Chairman; the Reception and Dance Committee, Mr. W. E. Best, Chairman, and to the Hotel Committee, Mr. W. J. Grambs, Chairman, for most efficient courtesy and unremitting care and attention in providing for the comfort, convenience and pleasure of their visitors to Seattle.

WHEREAS, The Technical Press has done everything lying in its power to advance the interests of this convention in the city of Seattle, and notwithstanding unusual conditions, has reported our proceedings in great detail, therefore be it

RESOLVED, That our thanks be tendered to the technical press of this industry, and particularly to the McGraw Publishing Company for the *Convention Daily* and to Mr. H. M. Wilson and Mr. W. E. Keily, for the accuracy and fulness of the daily report and the completeness of the list of registrations.

Likewise the Association desires to record its thanks to the local press for the full reports that have been given of the proceedings of the convention. It is a pleasure to record the unusual degree of cordiality with which we have been treated by the local press and its representatives.

WHEREAS, The people of Seattle without direct affiliation with the electrical interests have most cordially received our delegates and have been most hospitable and generous, especially with flowers in full bloom, in the use of automobiles for special occasions and in providing various forms of entertainment, therefore be it

Resolved, That the thanks of the Association be tendered to the people of Seattle for these thoughtful courtesies.

Likewise we wish to express our hearty appreciation of the eloquent address of Mayor G. F. Cotterill and, to the officials in charge of the city's electric plant, of the illumination of the streets in the neighborhood of the Armory.

Likewise we wish to extend our cordial thanks for the especial illumination of the various structures on the important thoroughfares of the city during the stay of the Association.

Likewise we wish to tender the thanks of the Association to Adjt.-General Llewellyn and Major Morse for the many courtesies extended to us in connection with our occupancy of the State Armory in the City of Seattle,

Whereas, The privileges of a number of clubs of the City of Seattle have been extended to our membership, therefore be it

Resolved, That our cordial thanks be returned to such clubs, especially the Rainier Club, the Arctic Club, the Engineers Club, the Seattle Golf and Country Club, the Town and Country Club and the Tacoma Country Club,

Whereas, Most efficient services have been given during the year by the elective officers of the Association, it is hereby

Resolved, That a full, appreciative and hearty vote of thanks be tendered to President Gilchrist and to the Executive Committee with congratulations on the remarkable progress shown during their year in office.

Whereas, The various standing and special committees have rendered devoted service to the interests of the Association and to our industry during the year, many of the members traveling great distances to attend the meetings, therefore be it

Resolved, That the thanks of the Association be tendered collectively and individually to these members.

While possibly invidious to make distinctions at such a time as this, when there has been so much good work done, your committee feels that especial thanks should be tendered to the Commercial Section for its several publications of practical utility and to the Meter Committee, especially to the Chairman of the Committee, Mr. O. J. Bushnell, and its Secretary, Mr. F. A. Vaughn, for the Electrical Meterman's Handbook, a volume of 1000 pages, the most complete manual devoted to any branch of our industry.

WHEREAS, The past year has witnessed an extraordinary growth in the membership, interest and widespread influence of this Association, still further increasing the work of the Secretary's office in detail of administrative and executive work, therefore be it

RESOLVED, That a hearty vote of thanks and expression of appreciation be tendered to our Secretary, Mr. T. C. Martin, who has shown personally the highest degree of loyal devotion to the interests of this Association.

It was regularly moved, seconded and voted that the Resolutions be adopted.

MR. DOHERTY: I would like to announce that in the Company Section meeting to-day the Doherty medal was hung up for another year and I hope it will incite some of the other Sections to produce some excellent papers. It occurs to me that we should perhaps have three prizes, one gold, one silver and one bronze medal. The other men who have taken a great deal of interest, Mr. Eglin for one, think that we should put up prizes, money prizes, to be used for the purchase of books. I will state that for this year there are to be two other prizes offered, either a silver and a bronze medal, or fifty and twenty-five dollars, at the discretion of the Executive Committee, with the condition that the second prize shall be called the Billings prize or the Billings medal, in recognition of her faithful work for this Association.

THE CHAIRMAN: I am sure the Association appreciates Mr. Doherty's spirit in offering these prizes and accepts them with pleasure.

MR. WILLIAMS: I would like to take over Mr. Doherty's proposition and offer the silver and bronze medals and I think the silver one should be known as the Billings medal. If anybody else wants to take the bronze medal, or if anybody wants to join in with us, let him feel free to do so.

THE CHAIRMAN: I think we have cleared up the afternoon program and all business with the exception of the report of the Nominating Committee.

REPORT OF NOMINATING COMMITTEE

MR. DOHERTY: Your Committee elected to nominate the officers and members of the Executive Committee for the following year submits the following list:

For President—Frank M. Tait, of Dayton, Ohio.

For First Vice-President—J. B. McCall, of Philadelphia.

For Second Vice-President—H. H. Scott, of New York.

For Treasurer—W. W. Freeman, of Brooklyn.

To serve on the Executive Committee for three years—John A. Britton, of San Francisco; C. E. Groesbeck, of San Diego, and Charles A. Stone, of Boston.

To serve on the Executive Committee for one year—R. S. Orr, of Pittsburgh.

Recommended to the Executive Committee for reappointment as Secretary—T. C. Martin, of New York City.

Nominating Committee
SAMUEL INSULL, *Chairman*
JOSEPH E. MONTAGUE
MIKE S. HART
H. T. EDGAR
HENRY L. DOHERTY

I want to explain that this year we have two vice-presidents to nominate, as Mr. Arthur Huey has found his time so encroached upon by his business that he is compelled to resign.

It was regularly moved, seconded and voted that the Report be adopted and that the Secretary cast the ballot in the authorized manner. This was done.

PRESIDENT GILCHRIST: I will ask Mr. Doherty to escort the new President to the Chair.

MR. TAIT: Gentlemen, I very deeply appreciate the honor you have conferred upon me to-day in electing me President of this great organization. I shall do the very best possible to advance the good interests of the Association, as I have always endeavored to do in the past. I want to ask the same loyal and hearty co-operation of the individual members to the incoming administration, that has been so faithfully given to our predecessors. I want to remind you also of what was said last night, that it is necessary for the western members to co-operate with the eastern and the eastern to co-operate with the western members. Therefore, let us all co-operate, so that we may do the greatest amount of good for the common cause of the National Electric Light Association and all that it represents.

(Adjourned *sine die.*)

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The STANDARD for RUBBER INSULATION

Whether purchased in the open market, from our agents, or direct from us, *Okonite* Insulated Wires and Cables never fail to meet unconditionally the most searching specifications and, consequently, the severest requirements of *any* service.

OKONITE is made in but *one* grade—the *BEST*

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A distinguishing mark on genuine OKONITE insulation consists of a single ridge running the entire length of the wire.

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(MURRAY PATENTS)

Protective meter and service cutouts—Subway cutouts and Cable racks.—Transformer network protectors—Seals and accessories. Also something new in

HIGH TENSION CUTOUTS AND FUSES.

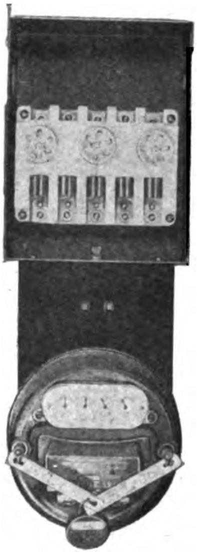

Fig. 1

Figure 1 shows our

TYPE S PROTECTIVE SERVICE CUTOUT BOX AND METER ADAPTER

applied to a Westinghouse type C Induction Watt-hour Meter. Cover removed, showing Service and Meter-testing Cutout.

Figure 2 shows our

TYPE S PROTECTIVE SERVICE CUTOUT BOX AND METER ADAPTER

applied to a General Electric Type I Induction Watt-hour Meter. Cover in position.

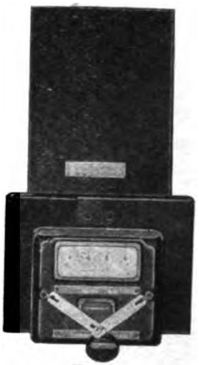

Fig. 2

Metropolitan A. C. Network Protector

This Network Protector, which is shown diagrammatically in Figure 3, is designed to instantaneously disconnect a defective transformer, protecting the secondary network by preventing an overload on the remaining transformers and a consequent interruption of the service. It is entirely electrical—positive in action—free from moving parts—requires no attention or adjustment.

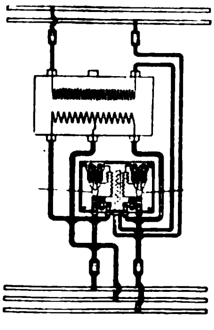

Fig. 3

Prices and descriptive matter on application.

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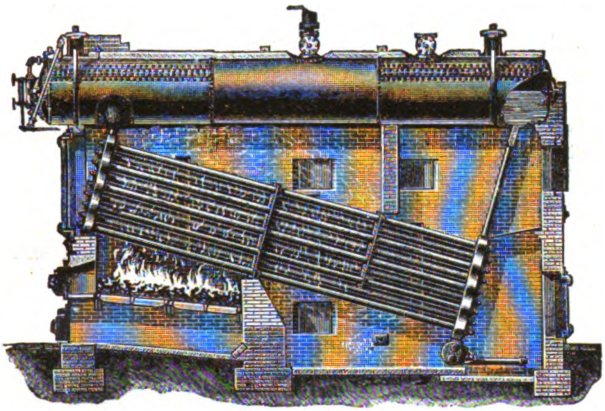

Babcock & Wilcox High Pressure Wrought Steel Construction Boiler

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The "Exide" Battery

For Emergency Service

The increased use of electrical energy with distribution over large areas has opened up a large field for emergency batteries which will take care of a large portion, if not the entire load, for short periods of interruption.

"Exide" Emergency Batteries

have been adopted by the following prominent companies:

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Washington Water Power Co., Spokane
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High discharge rates with high voltage.
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Light Weight.
Reduced floor space.

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1888—PHILADELPHIA, PA.—1912

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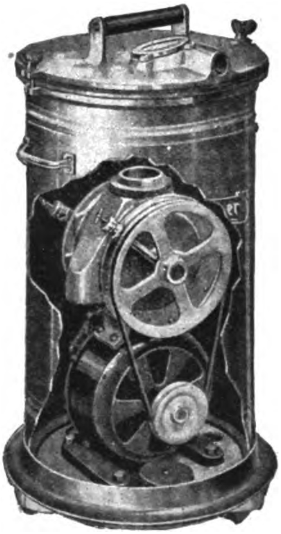
Federal Vacuum Cleaner



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Lamp Life and Human Life

An Analogy

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This is in no sense a *guarantee* that a *particular* human being will actually live to the age specified. But a certain percentage will.

Thus it is with incandescent lamps.

Under given operating conditions, an incandescent lamp of a certain type will *average* a definite number of hours burning.

This is by no means a *guarantee* that *every* lamp of this type will average that number of hours. But a certain type of lamp will *average* a definite number of hours burning at high efficiency.

Therefore, in justice to both manufacturer and consumer, calculations for renewal costs should always be based on *average* results.

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General Electric Company

The Guarantee of Excellence

Edison Lamp Department
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Edison Lamps

Raise the Standard of Electric Lighting

Standard Bulbs. It is easy to replace carbon lamps with Edison GEMS, which are supplied in the same size bulbs as the carbon lamps they replace.

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These two words are full of meaning to the discriminating purchaser of Mazda lamps. They represent a product whose unexcelled quality is the result of co-operative effort on the part of the foremost American lamp manufacturers.

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Bryan-Marsh Electric Works,
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Representative Shade Holder

Benco Socket

Admits Heavy Wiring, Obviating Use of Insulating Joint

Single Unit Ceiling Fixtures

with the high efficiency lamps now in use, require various sizes of shades and reflectors. Heretofore each installation involving a variety of holders involved a corresponding variety of ceiling rings or bases. This meant lack of uniformity in style, plus additional cost.

By using the BENCO SOCKET in a spun base, after the manner shown above, any size shade holder from 2¼" to 6" may be screwed into the socket. The original fixture design is thus retained, and a practically INTEGRAL FIXTURE secured.

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A Complete Line of Alternating Current Switchboard Indicating Instruments

EVERY detail of each of these instruments has been most carefully studied and worked out so as to be sure that each shall fully meet the most exacting requirements of the service for which it is intended. Neither pains nor expense has been spared in the effort to produce instruments having the longest possible life, the best possible scale characteristics, combined with great accuracy under the most violent load fluctuations, and also under the many trying conditions met with in practical work. Every part of each instrument is made strictly to gauge and the design and workmanship and finish were of the highest order of excellence.

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We make a specialty of manufacturing Complete Equipments for Light and Power Stations.

Our Meters, Alternators, Generators, Transformers, Switchboards, Motors, Etc., are used in some of the finest installations all over the country and have established for us a national reputation for quality.

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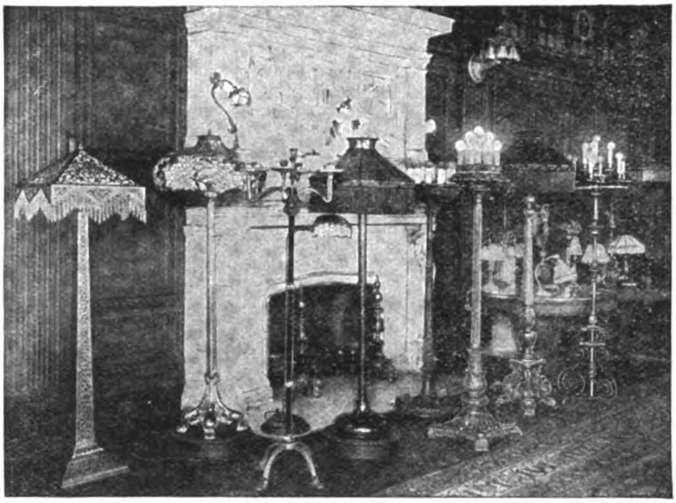

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Members of the National Electric Light Association are invited to visit Electric Shop when in Chicago.

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JACKSON AND MICHIGAN BOULEVARDS

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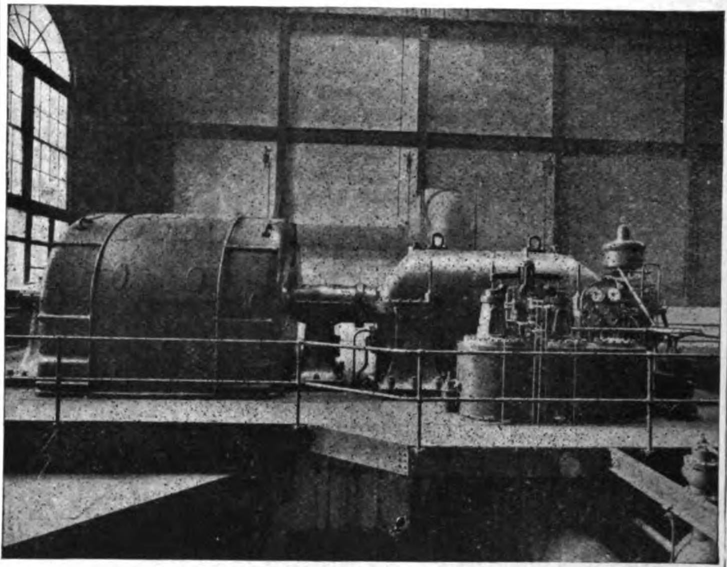

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Type C
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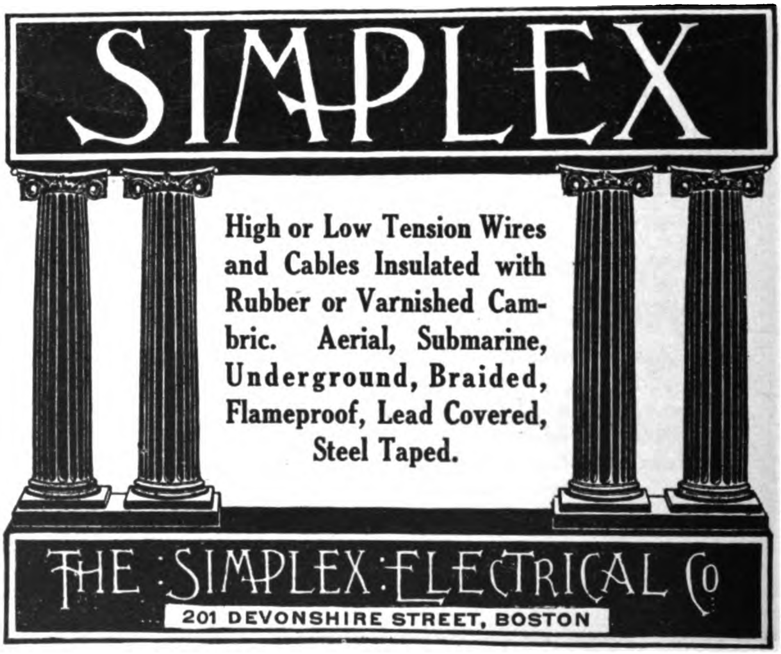

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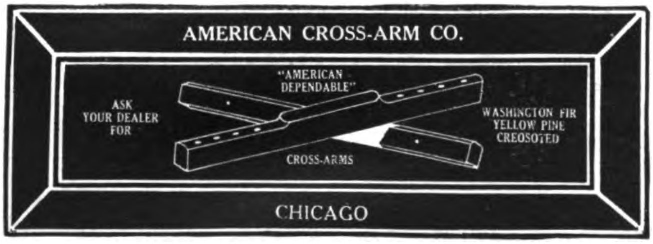

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